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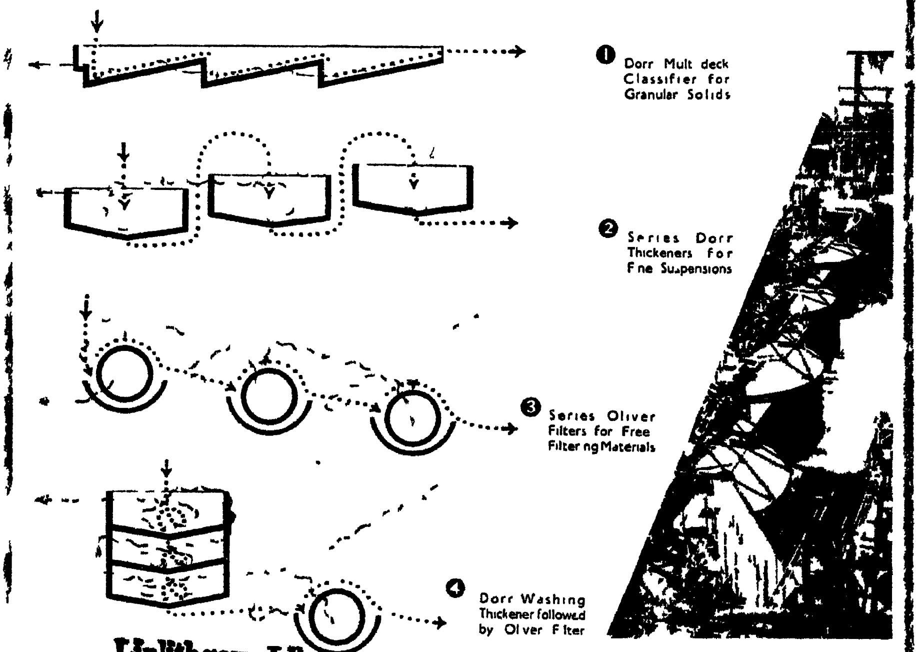
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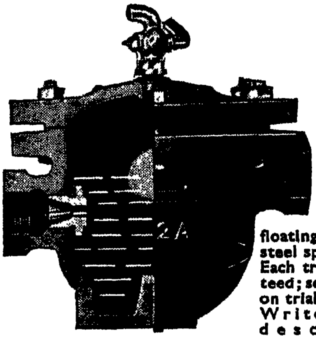

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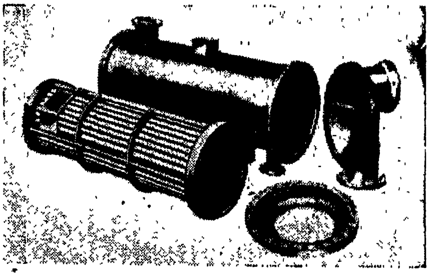

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Information Services in 1950

THE impulse to take stock must rank as an instinct, so compelling is the urge to sum up the factors which have combined to give a characteristic imprint to the year that has passed. It would be dishonest accountancy to disguise that harsh facts in some branches of economic industrial and political affairs have cast long shadows over 1949—and morbid to dwell upon them. The picture would be equally distorted, however, were no credit entries made in respect of the more hopeful influences and events, such as the tentative advance to more enlightened relationships between peoples and groups, which the year now gone seems to have presented more abundantly than had any of its predecessors. No year can have seen a more sweeping dissipation at the higher levels of the wartime habit of secrecy, and science and technology, at home and in the wider spheres, will be backward indeed if they do not ultimately show rich returns, aided by this new facility of making use of vicarious experience.

How long it will be before the results begin to materialise will depend upon the speed with which new data and fresh points of view can be assimilated and applied. No one knowing the difficulty which is familiar already to specialists in nearly all departments of science and technology of assimilating even the essential portions of the current literature will make light of the problem which will be presented by these large additions now being made by the new sources of information from overseas. Little thought, in fact, seems to have been given to that aspect of the comparatively new campaign to place information services on a wider footing than ever before, except perhaps by those on whom will fall the onus of making full use of the new facts. Formidable as will be their task, even they would not wish to see the process arrested, although the need to provide new aids to the existing "digestive system" is apparent to most of them.

The outstanding contrast between 1949 and all its predecessors in the freeing of information has perhaps been the reception in the U.S.A. of 16 "productivity teams" recruited from British industries, including iron and steel founding and fertiliser production. These teams have as a rule been received in American counterpart establishments with more candour than might have been shown to a fellow operator in America. The preliminary

On Other Pages

Leader:

Information Services in 1950 . . 1

Notes and Comments:

Advances in Ultrasonics . . 3
American Chemicals Census . . 3
Tonnage and Dollar Increases . . 3
Dr. James Young . . 4
Changes in Africa . . 4
Plant Orders for U.K. . . 5
Fuel Conservation . . 5
African Science Council . . 5
New Year Honours . . 6
German-U.S. Agreement . . 6
Oil and Fats Prices . . 6
U.K. and German Plant for Australia 6
Pharmaceutical Export Group . . 7
Selling U.S. Schering . . 7
New Fatty Acid Process . . 8
Petrochemical Progress . . 9
Anti-Corrosive Zinc Chromates . . 13
U.S.A. Develops Cheaper Source of Acrolein . . 13

METALLURGICAL SECTION

Corrosion Resisting Steels—II . . 15
British Welding Research . . 19
New Factor in Iron Casting . . 19
Reduction of Sulphur in Iron and Steel 20
Electrolytic Descaling . . 21
Welding Research in the U.S.A. . . 22
Ultrasonics in Industry . . 23
W. German Heavy Chemicals . . 24
India's Salt Problems . . 25
Loss to Plant Export Industry . . 26
Freer European Trade . . 30
Limiting Dividends . . 30
Limited Exemptions by Norway . . 30

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report of the iron and steel founders, in its length and far reaching character, gave a foretaste of the meticulous study which will be required of many other industries, including soon the dyestuffs, as the practice of matching British and American experience is extended into additional fields. Such preliminary reports, it is wise to remember, are little more than starting points of long discussion within each industry, and from these alone will useful permanent judgments be distilled. The readiness with which the iron and steel men have voluntarily collaborated since their return proves that they have few doubts about the prospects of good results of applying the lessons they received. The same kind of benefit can be expected to accrue in varying degrees to all the industries engaging in the same mission, but none will be able to evade the relatively heavy responsibility of carrying on widespread consultation here to make sure that the fruits of a unique opportunity are not squandered.

The productivity team principle is, however, only one among many evidences of the rising tide of specialised information. During the latter half of 1949 the 18 countries collaborating in the organisation of European Economic Co-operation were conferring on means of providing mutual aid in the scientific and technical fields. One of the main principles is, of course, the exchange of special literature and they have recognised that far more thought will have to be given to ensure full use is made of the information than to the means of distributing it. The first concrete result of this collaboration materialised in the starting on January 1 of the system for the exchange between all the OEEC countries of Government-published scientific and technical literature, of which the distributors here will be the TIDU department of the Board of Trade.

It becomes clear that an essential condition if all these new attempts to secure candid exchanges are to achieve their objects is that there should be given at least as much time and facilities for digesting the reports as were employed in their preparation. At a time when leisure is one of the scarcest commodities in any productive industry that represents in itself a problem of some magnitude.

Notes and Comments

Advances in Ultrasonics

THE emergence of the principle of employing inaudible vibrations from the more or less experimental stage to the status of a practical addition to the scientific tools used by industry may have been brought about by recent work in one of the larger British electronic research groups, some interesting results of which are described elsewhere in this issue. Some ultrasonic generators have, of course, already made a welcome contribution in expediting one or two industrial operations, such as the precipitation of air-borne particles; but, compared with the extreme diversity of services of which ultrasonics may be capable, nearly all the benefits would seem to be in the future. Among the possibilities for useful development are the determination of size and properties of certain molecules, testing of materials and thickness measurement and auxiliary aids in distillation, extraction, emulsification, oxidation and polymerisation. That far from complete list was mentioned at the recent 42nd annual meeting of the Institute of Chemical Engineers in America, where intense interest has been shown in the industrial prospects. There appears to be no firm evidence that the U.S.A. enjoys any substantial lead in practice. Now, to focus attention on ultrasonics, the American chemical engineers are sponsoring a review of the whole field, in ten papers, two of which will be presented monthly. The technology of ultrasonics may prove to be one of the most rewarding fields for implementing proposals for Anglo-American exchanges of information. This country would seem to be well endowed to give good value for information it receives.

American Chemicals Census

IF there is any argument in favour of a census of production in the United Kingdom which would counterbalance to some extent the fabulous amount of paper work entailed it might well be the advantage, which the U.S.A. enjoys, of having a clear picture of the state of development of individual industries. The census of manufactures which the U.S.A. saw in December for the first time since the war seems to justify all that has been claimed for the expansion of American chemical industries during war and since. It is of incidental interest that even in the U.S.A. it takes a year to produce such a gargantuan account. The results are those of 1947, but they are sufficiently arresting as evidence of what a post-war chemical industry can attain to discount the circumstance that they are not quite up to date. Not unexpectedly, it is in the field of medicinal chemistry that the most unprecedented advances in production have been made since 1939. In that year commercial output of medicinal chemicals represented a value of just over $21 million. In 1947 that figure had been raised by more than 800 per cent—to $201.76 million. Biological products and botanical extracts each achieved an increase of about 100 per cent, and pharmaceutical preparations of nearly 200 per cent.

Tonnage and Dollar Increases

FEW branches of American chemical industry failed to make at least a two-fold increase between 1939 and 1947, and, although some of this must be attributed to the steep rise in world prices, much more than this was needed to produce such phenomenal rises as those of industrial organic chemicals ($810 million to $3066 million), paints ($510 million to $1537 million) and vegetable and animal oils ($391 million to $2045 million). Reference to one tonnage figure, the output of 100 per cent sulphuric acid, which in 1947 was 10.78 million tons against 4.79 million in 1939, shows that these are not merely financial phenomena. That the U.S.A. now enjoys a long lead in the production of synthetic fibres and plastic materials is not news, but the 1947 value—$705 million for fibres, instead of $247 million, and $483 million for plastics against $83 million eight years ago—convincingly testifies how profitable their enterprise has been.

Dr. James Young

IN July this year will be commemorated the centenary of the beginnings of the Scottish shale oil industry, which developed from the patent obtained in 1850 by Dr. James Young for producing paraffin oil and paraffin from bituminous coal by slow distillation. The Royal Technical College, Glasgow, will be the meeting place for a gathering of experts at the second Oil Shale and Cannel Conference organised by the Institute of Petroleum, and Prof. W. M. Cumming will deliver the James Young Centenary lecture. James Young, born on July 13, 1811, the son of a joiner and at first a joiner himself, owed his escape to wider fields largely to Thomas Graham, whose evening lectures he attended at the Andersonian College. He became his assistant and accompanied him to University College, London, in 1837. By then, he had founded lifelong friendships with David Livingstone and Lyon Playfair, and the latter's was the influence which first turned his attention to mineral oils. After some years of experimentation on various types of coal, Young, on October 17, 1850, took out a patent "to obtain . . . paraffin from bituminous shales" by slow distillation, the specification being completed on April 16, 1851. He found that "Boghead coal" or "Torbane Hill mineral" was most suitable for his purpose, giving a yield of 120 gallons of crude oil per ton. As in the case of the early days of the gas industry, there was much litigation. Attempts were made to show that Young's ideas had been forestalled, and also to prove that the mineral at Torbane Hill was not coal. Had this contention been upheld it would have destroyed the value of his patent. Among his other work the Scottish chemist suggested the addition of caustic soda to bilge water to prevent rusting of iron ships (afterwards adopted in the Royal Navy).

Changes in Africa

CONSPICUOUS changes have been brought about at an unparalleled rate since the war in the conventional outlook by industry and commerce on the significance of South Africa. Recognition is paid to the fact that industrialisation is being grasped in several of the great territories whose productions in the past were few and specialised in the setting up of production branches or subsidiaries by a number of United Kingdom manufacturers, especially of paints and associated materials. Even though the transformation will probably lag behind the most optimistic forecasts, there is abundant evidence to show that the determination to make much fuller use of the natural wealth of territories such as Northern Rhodesia, for which £67,600 has now been granted for mineral research, and Southern Rhodesia is much more than a temporary policy. One of the projects promising ultimately to bring big changes in the scope of African industries is Southern Rhodesia's firm intention to produce oil on a large scale from the great coal reserves at Wankie. The latter are sufficient, it is said, to enable the two existing collieries, which have been raising 2 million tons a year since 1943, to maintain that relatively high rate for about 2000 years. The local Government meanwhile has acquired most of the Wankie concession's coal (for the modest price of £350,000) and contemplates raising about £10 million for the oil plant when the mass of technical problems, on which a number of specialists in this country are now at work, have been satisfactorily answered. Although the Southern Rhodesian Government now controls about 90 per cent of the readily available coal at Wankie, a State monopoly does not seem to be contemplated. Coal is being conserved for any company which will undertake the oil conversion processes.

PLANT ORDERS FOR U.K.

Larger Proportion for Fertilisers

THE allocation to British engineering interests of Indian orders for fertiliser producing plant, larger than was originally contemplated, is likely to be a result of devaluation of British and Indian currency.

A specific instance is the project at Bhadravati, Mysore (THE CHEMICAL AGE, *60*, 424) to provide plant for larger ammonium sulphate capacity and a new installation to yield ammonium nitrate. Plant orders in Britain are now expected to represent the equivalent of $1.6 million.

The erection of the complete plant is estimated to cost some £2 million and, before devaluation, the Indian directors of the project had intended to purchase all the necessary machinery from U.S. firms. Recently, however, two senior representatives, Mr. P. R. Balakrishnan, and the executive engineer, Mr. L. C. M. Reddy, flew to the U.S.A. and then to Britain for the purpose of reducing dollar expenditure.

As a result, it is now reported that purchases of American equipment are expected to amount only to about $2 million. Other soft currency countries besides Britain will also contribute.

Fatal Accidents Increase

NUMBERS of fatal industrial accidents in November totalled 125, eleven more than the previous month, but one fewer than in November 1948.

Five deaths were associated with chemicals, oils, soaps, etc. (one more than in October, 1949), while metal extracting and refining accounted for one; metal conversion, four; other metal trades, one.

Cases reported under the Factories Act, 1937, or the Lead Paint (Protection Against Poisoning) Act, 1926, in the U.K. in November showed one death was due to anthrax in the handling and sorting of hides and skins.

All cases reported under the two acts numbered 35, as follows:—Lead poisoning two (shipbreaking, one; pottery, one); other poisoning (compressed air illness) ten; anthrax, three; epitheiomatous ulceration (skin cancer), twelve (pitch, seven; tar, three; oil, two); chrome ulceration, eight (manufacturing of bichromates, two; chromium plating, five; other industries, one).

FUEL CONSERVATION

Extension of Government Service

A SAVING of about 15 per cent in fuel consumption by large industrial undertakings burning coal or oil, is said to be possible as a result of investigations made by a mobile testing unit of the Ministry of Fuel and Power (THE CHEMICAL AGE, *59*, 781). Immediate extension of this service is, therefore, to be carried out and three additional units are to be brought into operation.

To show the success of results obtained by experimental operation of the scheme during the past year, a Press conference and demonstration were held this week at Luton, organised by the Ministry, in collaboration with Laporte Chemicals, Ltd.

At one factory, states the Ministry, a survey of steam and power generating plant and heat and power utilisation revealed potential savings of nearly £20,000 on annual costs. This was partly achieved by more efficient operation of boilers and turbines and partly by simple modifications at various stages of the process.

At another works, only a few of the extensive range of instruments installed were functioning correctly. After tests lasting 10 days the management agreed that about 3000 tons of coal a year could be saved.

To prevent the full cost of operating the service from falling upon the public, firms requiring the mobile units are to be asked to make a payment of £15 for each day a van is employed, towards maintenance and running costs. A preliminary survey can be made without obligation.

African Science Council

A PERMANENT pooling of techniques and resources for assisting scientific research is envisaged as the result of the recent meeting at Witwatersrand University, Johannesburg, of science experts from five governments. (THE CHEMICAL AGE, *61*, 630).

It is expected that a result of the recommendations will be the appointment of a council "composed of scientists representative of both the subjects and the regions concerned, presided over by a scientist with a knowledge of African problems." One of the principal functions of such a council would be to encourage and establish contacts between research workers in the same or related fields, or in the same geographic regions.

NEW YEAR HONOURS

Distinctions for Industry & Research

SIR STEPHEN BILSLAND, one of the principal figures in the iron and steel industry and an authoritative spokesman for industry in national affairs, is created a baron in the New Year Honours List. Sir Stephen Bilsland, lately returned from leading a mission, sponsored by the Scottish Council, to study N. American markets. Other honours conferred, among which were peerages for five labour M.P.s, include these:—

Knight Bachelor: **JOHN COLDBROOK HANBURY-WILLIAMS**, chairman of Courtaulds, Ltd., for public services. *K.B.E.*: **FREDERICK BRUNDRETT**, chief of the R.N. scientific service. *C.B.E.*: **J. ANDERSON**, chief scientist, H.M. Underwater Detection Establishment, Portland; **N. H. JONES**, H.M. dep. chief inspector of factories, Ministry of Labour; **F. KIDD**, director of Food Investigation, Department of Scientific and Industrial Research; **PROF. A. M. TYNDALL**, chairman, National Physical Laboratory executive committee. *O.B.E.* (Civil Division): **H. T. CRANFIELD**, provincial advisory chemist (soils), Ministry of Agriculture; **J. V. FOLL**, managing director, Muirhead & Co., Ltd; **T. GOODEY**, senior principal scientific officer, Rothamsted experimental station; **E. GRIFFITHS**, senior principal scientific officer, Department of Scientific and Industrial Research; **H. HEPWORTH**, delegate managing director, Imperial Chemical Pharmaceuticals, Ltd.; **J. G. PEARCE**, director, British Cast Iron Research Association. *C.B.E.*: **G. E. HOLDEN**, Controller, Dyestuffs Control, Board of Trade. *M.B.E.*: **JOHN EDWARD BROOMHEAD**, superintendent of limeburning, Hindlow Works, Imperial Chemical Industries, Ltd.

Plant Orders for Australia

PURCHASE of plant and equipment, estimated to cost £A7.75 million, has been approved by the Victorian Government for the Australian State Electricity Commission's coal briquette project at Morwell.

Orders, totalling more than £A3.5 million have been placed in the United Kingdom for a complete boiler plant and three generators. The boiler plant is to be made by Mitchell Engineering, Ltd., at a cost (delivered) of £A2.85 million. The three generators will be installed by Metropolitan Vickers Export Co., Ltd., at a landed cost of £A773,000. The main plant order, worth £A4 million, has gone to Maschinenfabrik, Buckau A.G.

GERMAN-U.S. AGREEMENT

Liaison in Agricultural Chemicals

THE marketing of certain new insecticides developed by the German chemical company, Farbenfabriken Bayer, will be undertaken by a new American firm, as yet unnamed, which will be a jointly-owned subsidiary of the Geary Chemical Corporation and the Pittsburgh Coke & Chemical Company. The new firm will also engage in production of the insecticides.

Production and marketing of the new chemical products in America will be under terms of a contract entered into between Bayer and Geary Chemical, which has been approved by both American and British occupation authorities in Western Germany.

U.S. Technology

Under the terms of the agreement, the Bayer Company in Germany will make available to Geary Chemical Corporation current and future scientific and manufacturing discoveries in the agricultural chemical field, as developed in the Bayer laboratories at Leverkusen and Elberfeld, Western Germany.

Extension of Geary Chemical Corporation's agreement with Bayer to cover other agricultural products such as fungicides, rodenticides, and plant hormones, is provided for, as is the exchange of related technical and scientific data.

Oil and Fats Prices

IT is officially announced that no change will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period ending February 25. During the five-week period ending February 4, the following changes will, however, be made in the prices of palm oil and Australasian inedible tallows:

Palm Oil: From £97 15s. to £99 per ton c.i.f. in bulk, plus £1 per ton for loaned drums, and an extra £1 10s. for delivery in returnable casks.

Australasian Inedible Tallows: Ranging from £102 10s. per ton c.i.f. (basis casks or drums) for prime mixed (no change) to £99 15s. to £80 for low and no colour.

Tallow supplied in barrels or tierces will cost £1 15s. per ton extra. The prices of all other unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users are unchanged.

PHARMACEUTICAL EXPORT GROUP

Practical Objectives of New Organisation

NEGOTIATIONS which have been in progress for several months have resulted in a decision to merge, as from January 1, the Pharmaceutical Export Group with the Association of British Pharmaceutical Industry, under which latter title the joint organisation will be carried on.

A statement issued by the new group says that it was regarded as an essential feature of the merger that the joint organisation shall provide at least as good an export service to its members as was enjoyed by the members of the Pharmaceutical Export Group. Not least important, it was insisted that there should be a guaranteed and adequate representation of export interests on the governing body of the joint organisation.

Two executive bodies have been created —one for home and one for export matters —and it is intended that the delegation to them of many of the immediate and practical problems affecting the industry will enable the council of the association to give more time and thought to questions of long-term policy in the interest of the industry's future development and progress.

Many such matters, which indirectly may be of as much importance from the standpoint of the industry's place in the national economy as from that of individual firms themselves, have already engaged the attention of the former council of the association. Among the objects of the association is the promotion of efficiency within the industry, and one of the ways in which this is being pursued at the present time is the preparation of a manual on costing, which is now nearing completion.

Stimulating Productivity

Other matters which are receiving the council's attention are the question of stimulating productivity in the industry by means of the mutual interchange of knowledge already existing among firms in this country, and by the suggested organisation of a team to visit American establishments under the auspices of the Anglo-American Productivity Council.

A committee has been set up to advise the association council from time to time on the relative value of exhibitions, and to co-operate with the promoters of those exhibitions in which members of the industry are interested with a view to effecting practical improvements where possible. The council is also making a survey of the needs of the industry in regard to trained pharmaceutical personnel.

On the export side activity is being particularly directed to the possibilities of increasing the industry's exports to the dollar markets, especially Canada.

Dominions Customers

Value of exports of pharmaceutical products—principally to India, Pakistan, South Africa, British West Africa, Australia, and Egypt—increased from £12,807,151 in 1946 to £16,790,000 in the first 11 months of 1949.

Officers of the newly constituted association are:—President: Mr. R. L. Taylor (Johnsons of Hendon, Ltd.); vice-president: Mr. J. C. Hanbury (Allen & Hanburys, Ltd.); hon. treasurer: Mr. H. C. H. Graves (Vitamins, Ltd.); trustees: Mr. H. J. Baker (Duncan, Flockhart & Co., Ltd.), Mr. J. Stuart Hills (John Bell, Hills & Lucas, Ltd.) and Mr. J. W. Wigglesworth (Wigglesworth, Ltd.); secretary: Mr. C. W. Robinson; assistant secretary: Mr. A. Duckworth; assistant secretary (export) Mr. J. M. Kirkness. Elected members of the council include representatives of virtually all the principal producers of pharmaceuticals.

Selling U.S. Schering Group

THE acting director of the U.S. Office of Alien Property, Mr. Harold L. Baynton, expects that the Government will complete the sale of the Schering Corporation some time during the spring of 1950. The drug manufacturing firm, seized by the U.S. Government as alien property at the outset of World War II, is one of the largest in size, after the General Aniline & Film Corporation, still being held by the Justice Department. The pharmaceutical manufacturing firm, with headquarters in Bloomfield, New Jersey, registered sales in excess of $12 million in 1948. It is reported that over 250 inquiries from potential buyers have been received. Law suits by other claimants of the Government-owned stock have been settled.

NEW FATTY ACID PROCESS

U.S. Fractionation Method in Lancashire

AFTER three years of intensive activity, a plant will be completed at Littleborough in Lancashire within a few weeks to distil fatty acids by a fractionation process producing commercial quantities of fatty acids of hitherto unobtainable purity. These fatty acids will be marketed under the trade name of Distec.

The company, Hess Products, Ltd., has taken over in Britain the patent rights of the process from the American pioneers in that field, Armour and Company of Chicago, the meat packing and chemical organisation. All the capital has been raised in this country and at present amounts to well over £250,000. The unit will have an annual production of 15,000 tons.

Research Work

The process is very similar to that employed in the distillation of petroleum and has been developed and brought to its present pitch of efficiency by the research work of Armour and Company. There had been limited technical improvement in the distillation of fatty acids, and fractional distillation offered the greatest advance in the technique of separation.

The pioneer work on fractionating, started before the war, encountered great difficulties associated with designing equipment which would withstand the highly corrosive action of fatty acids and would produce pure fractions without harming the products through the employment of high temperatures. One by one, the difficulties were overcome, permitting a great advance in fatty acid technology.

The site at Littleborough has been chosen because it is conveniently between the ports of Hull and Liverpool and is only fourteen miles from the dock system of Manchester. There are 10 acres and further space for development.

The plant consists essentially of a series of fractionating columns containing bubble-cap trays of the latest design. The columns operate under high vacuum, and steam can be injected as desired to assist close fractionation and reduce operating temperatures.

The whole of the distillation unit is constructed of stainless steel, and a tremendous amount of research lies behind the choice of the expensive alloy used. The main distillation unit is being erected by the engineers, Foster Wheeler, Ltd., of London, and Foster Wheeler Corporation of New York. Design and drawings of the plant were prepared in the U.S.A., the London company being responsible for erection. The whole of the fabrication and construction of this plant has been carried out by British engineers with British labour.

Heat transfer is by means of diphenyl vapour and a 6 million B.Th.U. diphenyl boiler is being used initially; additional units are soon to be installed. This furnace is fully automatic and is equipped with air operated control instruments for regulation of pressure, temperature, etc., and has an elaborate system of electrically-operated safety devices.

The heat exchangers used in the distillation unit itself are the result of years of experiment in design and ensure large-scale operation under conditions which prevent any thermal decomposition of the stock being handled, and the small losses now sustained in operation should be reflected in the attractive prices of the finished materials.

Automatic control is used on the distillation unit even more lavishly than on the diphenyl boiler. Air operated controllers regulate flow, heat input, vacua, reflux, stream coolers, vapour condensers, etc., and render it possible to control within fine limits a complex installation some 100 ft. high, with more than 1000 regulation points.

Distillation Control

The instrumentation is all centralised in a distillation control room and process control engineers supervise works operations at this point. In addition to the main laboratories, a plant laboratory is located next to the control room so that an analytical check can be made at close intervals on all product streams.

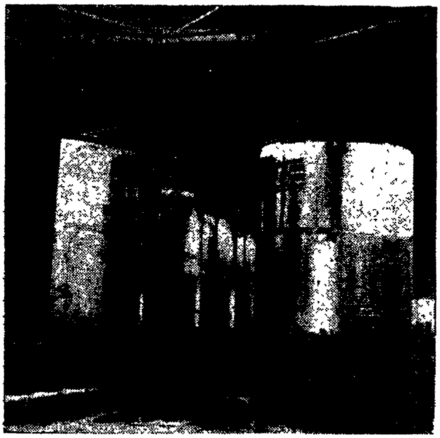
Specially designed pumps are housed in a centralised pump room, and are installed in duplicate to ensure continuity of operation. These are in stainless steel, and consist of many types, capable of pumping crude fats at 150° F. or fatty acids up to 500° F.

The distillation arrangement is the heart of the installation but a considerable amount of ancillary equipment is also necessary. Tank farms are available for crude fats, fatty acids prior to distillation, and finished products. The tank farm for the finished products is of special importance. These tanks are closed, and constructed of high purity aluminium, and inert gas atmospheres are maintained in them to protect the fractionated acids as made. The heating is thermostatically controlled to avoid the possibility of damaging sensitive materials.

High pressure splitting of the crude fats and oils is used and a battery of stainless steel autoclaves is available for this purpose, the stainless steel being over 1 in. thick. High, medium and low pressure steam boilers are installed, together with extensive glycerol treatment and evaporation plant.

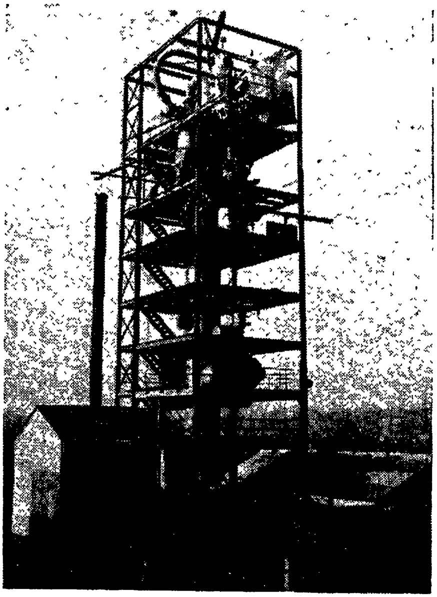
Elaborate precautions have been taken to ensure against contamination, and separate pipe networks exist for saturated and unsaturated acids. Illuminated sight boxes are liberally used to give visual examination of products at many process stages. Much equipment is provided for varied processing of products, and new facilities for such items as flaking and straight distillation. The cooling water circulating installation and the internal water purification plant have been constructed on a scale large enough to accommodate expansion of activities.

In the actual process, the hydrolysed oils or fats are carefully washed and settled in the splitting section, and are then stored in a tank farm prior to distillation. Any oil or fat can be handled as desired, as the distillation unit is designed to be extremely flexible and can separate the components of a great variety of charge stocks. The dry stock is pumped at controlled rate to the first of a series of fractionating towers. Each tower is complete with Dowtherm heat exchanger, vapour condenser, tube jet, reflux accumulator, control gear, instruments and pumps.



[Courtesy Hess Products, Ltd.

Battery of reception tanks for fatty acids



[Courtesy, Hess Products, Ltd.

The distillation unit and (left) the Dowtherm boiler house. The pump house and control room are seen on the right

The object of the process is to remove fractions of increasing boiling point as the stock flows through the tower series. For this purpose the towers are maintained at different levels of vacuum and temperature, and varying reflux ratios and input of superheated stripping steam are used. For example, the first tower is operated at 35 to 40 mm. at the top with low reflux ratio, removing the lowest boiling point fraction of all which contains odour bodies and some of the unsaponifiable. This initial tower serves also to dewater and remove dissolved gases from the stock.

This initially treated stock is then pumped to further towers which operate under vacuum of 3 to 5 mm. at the top, and here extensive reflux ratios are employed to separate the component acids whose boiling points differ by some 20° C. each two-carbon interval. Later multi-tower distillation stages prepare acids with a purity higher than 90 per cent. It is possible to operate the tower series in varying ways and three, four or five fractions can be obtained as desired.

(continued on page 12)

Petrochemical Progress

A Promising Partner of the New Refinery Plants

[Courtesy, Petroleum Information Bureau

One of the staple products made available by large scale refining in the U.S.A. has been synthetic rubber derived from butadiene, seen here in its unprocessed state

REVIEWING the many advances made in industrial technology during the past ten years—and especially in the post-war period—one of the most impressive developments has been in the evolution of the newly-established petrochemical industry. That is identified, in this country, with the plants now in operation or building at Stanlow, Partington, Grangemouth and Wilton which may well become the foundations on which a major British industry will be built.

While the truth of that remains to be proved, the experience provided by the maturer industry in the U.S.A. is important and it is significant that the trend there has been one of virtually continuous expansion of the means to convert some of the refinery products into materials for chemical processing. Obviously, no direct parallel between the British and American industries can be drawn; some of the American pointers are impressive.

In the U.S.A. already the equivalent of £850 million has been spent or allocated on the building of petrochemical plant; yet many U.S. authorities consider that existing trends justify expenditure of at least another £100 million on further expansion.

Those facts are recorded by the Petroleum Information Bureau, which points out that the petro-chemical industry, in common with most other scientific undertakings, is far from being a prodigal consumer of raw materials. According to the estimate of the eminent American oil technologist, Gustav Egloff, of America's total annual crude oil output—now running at close on 300 million tons a year—only 0.5 per cent is consumed in production of petrochemicals. And of this comparatively negligible percentage, the bulk is derived from gaseous by-products automatically obtained during crude oil's refining and which until recently were burned in the refineries as waste.

Increasing Derivatives

The petrochemical industry owes its existence to the great progress made during recent years in the science of petroleum refining. That is, of course, the explanation of the lead which the U.S.A. clearly maintains at the moment. Refineries to-day are producing as many as 1000 different petroleum derivatives, among them the derivatives on which production of petrochemicals depends. Already, such chemicals furnish 30 per cent of the raw materials for the U.S. organic chemical industry and this proportion seems bound to increase.

No fewer than 50 American oil refineries are now specialising in petrochemical production, and the range of these products is being constantly increased as research by the oil industry leads to the evolution of further derivatives.

Primary Object

In reviewing briefly a few of the better-known petrochemicals, it is necessary to bear one important factor in mind. Refineries—including those plants incorporating production of petrochemicals within their activities—exist primarily for the production of fuels and lubricants. Refining schedules are therefore nearly always calculated with a view to obtaining the maximum quantities of those major products which can be economically recovered.

Most decisions regarding starting and stopping production cycles, operating conditions, changing feed stocks, eliminating sulphur compounds, etc., will therefore be made with the output of fuels and lubricants foremost in mind. Hence the nature of raw materials available for production of petrochemicals must be governed by refining schedules not planned specifically for their production.

Nevertheless, advanced refining technique in processes for the production of motor fuel—such as catalytic cracking—automatically results in production of gases in abundant quantity which are eminently suitable for conversion into petrochemicals. While such gases can be polymerised and converted into further quantities of gasoline, a proportion, at any rate, may be readily available for use by the petrochemical industry

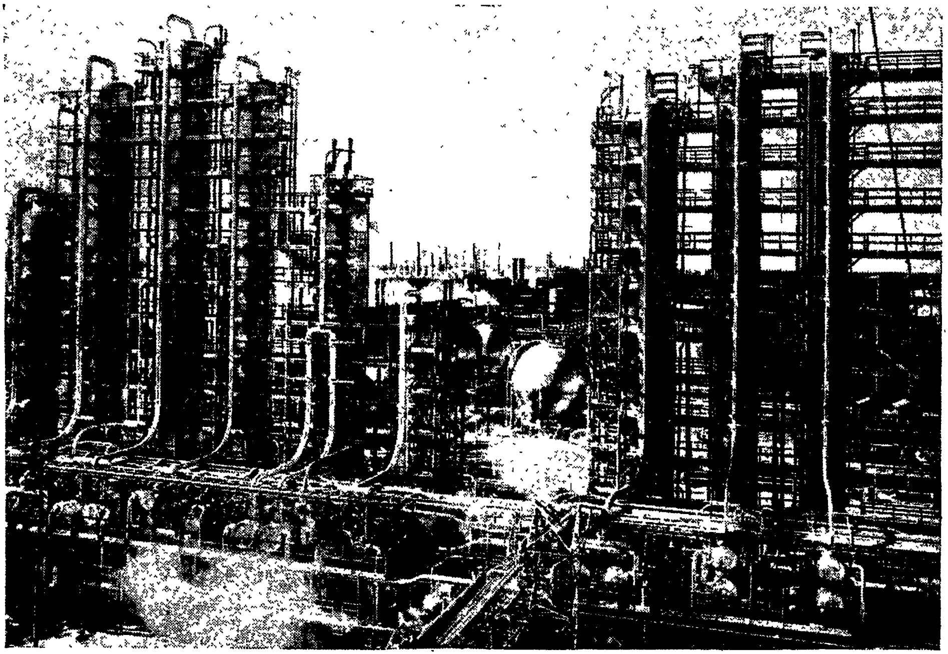
Such liquefiable petroleum gases—the highest vapour-pressure petroleum derivatives which can be transported by road, rail or sea in fluid form—are extremely useful to petrochemical manufacturers who may require only limited quantities of such raw materials and whose plants are distant from the refinery. (The simplest form of raw material for petrochemical production is, of course, natural gas itself—which contains the simplest paraffin, methane. But natural gas must be fed to chemical plants by pipeline, which precludes its extensive use even in a country as richly endowed with the natural material as the U.S.A.

Some petrochemicals are obtainable from crude oil without any special processing. These include naphthenic acid (for the manufacture of soaps and paint driers), cresols (as wood preservatives) and hydrogen sulphide (for the production of sulphur and sulphuric acid).

Among the petrochemicals now in considerable bulk demand are the oxidation products derived from hydrocarbons, such as the aldehydes (especially formaldehyde), the simple alcohols (methyl, ethyl, propyl, butyl, and amyl), polyalcohols and ethylene glycol—a dialcohol.

Besides these bulk products, there are many other oxidised petroleum derivatives which, though produced in smaller quantities are no less important. These include the organic acids, of great value to many industries, especially the textile industry, and the ketones used as solvents in scores of different commercial processes.

During the treatment of crude oil for production of lubricants, the oil refineries themselves consume large quantities of methyl ethyl ketone, as well as using sub-



[Courtesy, Petroleum Information Bureau

The source of many petroleum derivatives of value to chemical industries—light ends fractionating unit forming part of the huge assembly of refining plant at Baytown, U.S.A.

stantial amounts of other oxidised petroleum products as additives and improvers for lubricating oils. Prominent among oxidised products for which a ready market exists is phthalic anhydride—obtained by oxidation of the *o*-oxylene formed during catalytic cracking. The principal use of this petrochemical is in production of alkyd resins and plasticisers.

As it evolves its range of products, the petrochemical industry will not only serve other spheres of commerce, but will also appreciably reduce the consumption, for industrial purposes, of fats and other commodities suitable for food. In 1948, U.S. production of the petrochemical glycerol (glycerin) reached just over 15,000 tons. For every ton of glycerin obtained from petroleum, a ton of fat is diverted toward the nation's larders. Glycerol is a derivative of propylene—in turn obtained from cracked petroleum gases.

Similarly, in 1948, U.S. production of ethyl alcohol (also obtainable synthetically from the ethylene derivative of cracked petroleum gases) amounted to 160 million gal. Of this total, 70 per cent was obtained from petroleum and only 30 per cent by fermentation of grain, molasses or other farm products.

Thus, the contribution of the petrochemical industry in increasing the world's food supplies is not confined to the production of fruit-tree fertilisers (as butylene), root crop fertilisers (as ethylene) or cereal or soil fumigants (as ethylene oxide and dichloropropane-dichloropropylene).

It is extremely encouraging to note the energetic steps already taken in this country—both by the oil industry and by the chemical industry—to establish an active British petrochemical industry. Not only is the industry of obvious value in catering for the needs of contemporary industrial enterprises, but, in fulfilling those needs, it is likely at the same time to effect an appreciable saving in dollars. Polythene and ethylene oxide, for instance, both of which can be produced as petrochemicals, have hitherto come from molasses, imported largely from dollar areas.

NEW FATTY ACID PROCESS

(*continued from page 9*)

The arrangements for the control of reflux and the care taken for temperature control are salient features of operation. The pure acid fractions are pumped through stainless steel pipes to a distribution pipe grid, and stored under inert gas in aluminium finished-product tanks.

The products from the plant fall into two groups: saturated acids and unsaturated acids. The saturated acids can be produced up to 90 per cent purity, including all even carbon chain length acids from caprylic up to stearic. The achievement of commercially isolating individual acids places the technologist in the position of being able to elaborate almost any fatty acid mixture he desires and removes his dependence upon mixtures occurring in natural oils and fats.

The unsaturated acids are fractionated into groups of different carbon chain length but the fractions contain acids of varying degrees of unsaturation. The fractional distillation process does not separate unsaturated fatty acids of the same carbon number. The saturated acids will, it is stated, make available in Britain for the first time fatty acids from caprylic to stearic whose composition can be definitely determined. Great possibilities are opened up for chemical derivatives based on these high purity acids.

The brochure which Hess Products have issued gives the possible applications of each fatty acid as well as a detailed specification. Several grades of a fractionated acid can be made, and stearic acid can be produced in two purities of 75 per cent and 90 per cent. An interesting material consisting of 67 per cent palmitic, 29 per cent stearic and 4 per cent oleic, which gives a eutectic mixture with a low melting point of 54°C., will also be available. This material, possessing a waxy, hard appearance, is particularly suitable for candles, polishes and buffing compounds.

Many Uses

The 75 per cent stearic acid whose other constituents are 22 per cent palmitic and 3 per cent oleic is recommended for grease making and rubber compounding. Some of the major fields for 90 per cent pure palmitic acid and stearic acid are in metallic soaps and as mono- and di-glycerides for emulsifying agents; 90 per cent myristic acid and 90 per cent lauric acid are said to have great possibilities in the soap and detergent field, and lauric acid is particularly valuable in plasticisers for synthetic resins.

The unsaturated fractions should well serve the unsaturated acid field such as soft soap, varnishes, paints, enamels, alkyd resins, polishes, flotation, and printing ink.

Due to economic advantages and process efficiency the prices of the fractionated acids will, it is stated, be competitive with those of the less pure materials.

ANTI-CORROSIVE ZINC CHROMATES

Survey of International Research

CORROSION and anti-corrosives in relation to basic zinc chromates were discussed at a joint meeting in Brussels of Belgian paint associations (Assn. des Techniciens de l'Ind. des Peintures et des Connexes, and the Ind. des Vernis, Peintures, etc.).

In a paper (published in full in *l'Ind. Chim. Belge, 14,* 42-48 and 91-97), read at the meeting, H. Rabate, who is connected with the *Travaux de Peinture,* Paris, showed how Riskin and his co-workers in Russia concluded that the mixed chromates of zinc and chromium prepared from the oxide, hydroxide, and carbonate of zinc, or by the acid method, were hydrated mixtures of zinc and chromium oxides, with or without the sodium oxide.

By increasing this latter, and also the chromium oxide, precipitation was easier, and quality of the product improved. The weight of bichromate used could be 1½ times that of the zinc oxide.

The best results were obtained by treatment with 18-22 per cent hydrochloric acid. These zinc-sodium chromates dissolved more readily in cold water than the zinc-potassium chromates. It was possible to replace at least half the potassium chromate by that of sodium.

Similar results were obtained by Nortz at Poitiers University, in his work on the yellows, and on both tetra- and trihydroxychromates of zinc, on which a large amount of research had also been done in the U.S.A.

Nortz prepared materials from potassium bichromate or chromic acid, containing up to 70 per cent zinc oxide, and water of constitution up to nearly 12 per cent. Solubility in water was only 0.12 to 0.74; and, as is shown by American results at Miami, this higher zinc oxide content, with water solubility either nil or negligible, is an important factor in the quality and stability of anti-corrosive films.

Reference was also made to the work of Ledwith and others on water absorption of films (*Jnl. Oil and Col. Chem. Assn.,* 1946, Apr., 67-78) showing that the addition of zinc tetrahydroxy-chromate of zinc did not increase, but might even reduce, water absorption.

The author emphasised the importance of granulometric structure and morphology, or, more particularly, particle size, shape, and distribution, in the anti-corrosive properties of pigments, as exemplified in the case of lead cyanamide.

Schulz, of the Höchst works in Germany, among others, had indicated the importance of the acicular particle form of this pigment. If, by too fine grinding or other causes, this structure was destroyed, the protective properties of the film were greatly diminished.

In his thesis, M. Rabate included a general review of some of the already known work on corrosion and anti-corrosives, and some possibly less well known, or not yet reported, in Russia and France. The former was chiefly that of Riskin and co-workers (*J. Prikl. Khim.,* 1939, *12* (12), 1780-86) and of Chelinski (*Promys. Org. Khim.,* 1939, *6* (11), 623-627), both dealing mainly with zinc yellows.

The French research was that of Maurice Nortz, Faculty of Science, University of Poitiers, principally with trihydroxychromate of zinc, under the direction of Prof. Amiel.

U.S.A. Develops a Cheaper Source of Acrolein

PRODUCTION of acrolein by a new, economical process—the direct oxidation of propylene—is now being developed at a pilot plant at Emeryville, California, U.S.A., by the Shell Chemical Corporation. The corporation had previously been making acrolein at Houston, Texas, by the thermal cracking of diallyl ether, but that plant has now been closed.

Acrolein is a major raw material in the production of synthetic methionine, an important amino acid, and there are great possibilities for this versatile aldehyde in textiles, resins, plastics, coatings and drugs.

It is suggested in *Chemical Engineering* (*56,* 11, *67*) that the new process involves contacting the olefin with oxygen or an oxygen-bearing gas in the presence of cuprous oxide or a supported cuprous oxide catalyst. In general, the process can be used to convert olefins with three or more carbon atoms to vinyl type aldehydes or ketones.

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Metallurgical Section

7 January 1950

CORROSION-RESISTING STEELS—II

*Sources of Attack and Comparative Resistances**

by J. A. McWILLIAM, T.D., M.A.

REFERENCE was made earlier to FDP and FCB steels, the former being stabilised against intercrystalline corrosion by the addition of titanium and the latter by columbium. The titanium is more potent, and the titanium content should be a minimum of four times the carbon content; with columbium the minimum should be eight times the carbon content, and it is usual to add columbium to about 10 times the carbon content. The FCB quality is accordingly more costly than the FDP quality.

The chief use for the FCB quality is in the production of electrodes for electric arc welding. Before the war, much effort was expended in trying to produce an electrode which would give a deposit which contained sufficient titanium to prevent intercrystalline corrosion, but this effort was not entirely successful.

Carbide Precipitation

Another way of overcoming intercrystalline corrosion is to lower the carbon content sufficiently to minimise carbide precipitation, as in FSL quality. Fig. 1 shows two wires taken from a welded pickling basket. The wires had been spot welded together and it will be seen that in the pickling solution one wire was severely attacked adjacent to the weld, while the other wire was unaffected.

The wires were supposed to be of the same analysis, but investigation showed that although both wires were made from 18/8 steel the corroded wire contained 0.14 per cent carbon and the unaffected wire 0.06 per cent carbon.

The shape of the corroded zone is of interest, as it shows that the top end of the range of the deleterious temperature is sharply defined, but the bottom end of the range is rather less clearly defined.

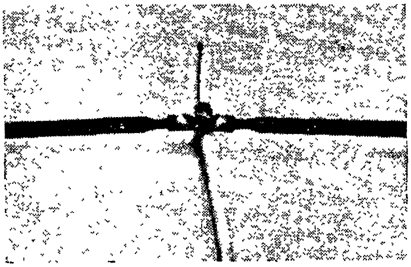

Fig. 1

Branch and Sweeten[3], in their paper to the Institution of Chemical Engineers, referred to the formation of sigma phase particularly in the 18/8 types of steel, containing about 3 per cent of molybdenum, with titanium or columbium.

When such steels are reheated in the range of temperature from 500°-900°C., the ferritic phase which is normally present in all the molybdenum-bearing 18/8 steels, transforms partly into sigma phase, with consequent decrease in ductility and possible lowering of the resistance to corrosion.

Kirkby and Morley[4] showed that the reheating of 18/8 steel, containing about 3 per cent molybdenum plus titanium, lowered the magnetic permeability. It is noteworthy that the effect of re-heating for one hour to 800°C. considerably lowers the magnetic permeability.

When tested with a powerful hand magnet, practically no pull will be felt on a steel containing a large percentage of sigma phase, while the same steel in the optimum condition shows a considerable pull.

Fig. 2 shows the microstructure in the properly heat-treated condition (water-quenched 1050°C.), at about × 1000, the austenitic phase appearing somewhat darker, and the ferritic phase remaining lighter.

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* Concluding the paper presented recently before the Institution of Chemical Engineers, in Birmingham, of which the first part was reproduced in THE CHEMICAL AGE, *61, 769.*

Fig. 3 shows the microstructure of the same steel after one hour at 850°C., illustrating the partial conversion of the ferritic phase into sigma phase. The steel can be restored to its optimum condition by reheating to 1050°C., followed by water quenching.

In choosing a steel for a particular piece of chemical plant, the first consideration is how the steel will stand up to the corrosive conditions. The best method is, of course, to test the steel under actual working conditions and, if there is liquid and vapour present, the test-pieces should be sufficiently long to be tested under both conditions. If there is air above the liquid, the test-pieces should include the air-line, as this is where corrosion is generally most likely to occur.

In the case of a jacketed vessel, of which the contents are heated, splashes of the liquid may become more concentrated above the air-line, and so cause corrosion. This possibility should be kept in mind.

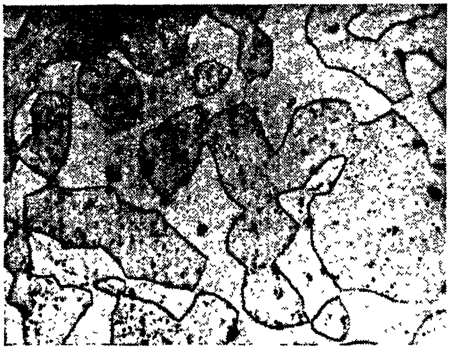

Fig. 2

The test-pieces should, of course, be weighed before and after the test, but the use of polished test-pieces is an advantage, as small amounts of corrosion can more readily be observed. The nature of the corrosion, whether it is general or pitting, can also be seen.

Corrosive conditions are not always what they seem. The author was asked to investigate an apparatus for the production of distilled water of high purity. The apparatus was made from 18/8 steel, and the input water was an excellent town supply of soft water. Examination showed that there was an incrustation of salts, above the liquid level in the boiling pan, and a small amount of corrosion had taken place.

It transpired that the apparatus had been running continuously for several weeks without the removal of the evaporated water, and, in fact, the pan was being asked to stand up to a concentrated boiling solution of salts. The vigorous boiling carried over traces of this solution which contaminated the distilled water.

In wool dyeing machines, many years ago, occosional corrosion was experienced, under conditions which would be expected to be harmless, the boiling liquor containing very dilute sulphuric acid, sodium sulphate and colour. The only unknown factor was the colour, which, when examined, was shown to contain a considerable percentage of sodium chloride. Its presence had been found necessary in order to dilute the strength of the colour and it had been the cause of the corrosion.

The molybdenum-bearing 18/8 steels are now used for these dyeing machines and the trouble has been eliminated; but the author considers that it could equally well have been surmounted by the use of sodium sulphate to dilute the colour.

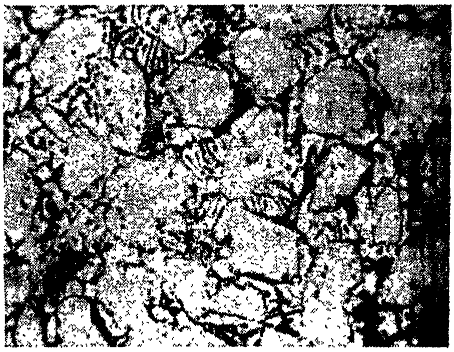

Fig. 3

Halogen compounds should always be given careful consideration, as their presence may be the cause of pitting corrosion.

Where tests under working conditions are not feasible, laboratory tests may be the guide to the anticipated performance of a corrosion-resisting steel. The series of tests shown in Tables 4 to 8 may be of value in this connection.

The standard test used in the Brown-Firth Research Laboratories to obtain the results given in the tables consists in the total immersion for 24 hours of emeried cylinders $1\frac{1}{4}$ in. long by $\frac{1}{2}$ in. diameter, in 80 ml. of reagent. Below 0.0004 gm./sq. cm./24 hours the attack is usually considered sufficiently small to warrant the use of the corrosion-resisting steel. This amount of corrosion, assuming the attack to be evenly spread, amounts to about 0.2 mm. in a year.

It will be noted that with nitric acid no advantage is gained by using FMB as compared with FDP. With sulphuric acid, FMB under many conditions is better than FDP and "254" is better still. With hydrochloric acid it is only in dilute solutions that even "254" can be recommended. With various concentrations of acetic acid at boiling point, FMB shows marked improvement over FDP.

Acknowledgments are made to the directors of Firth-Vickers Stainless Steels, Ltd., for permission to publish this paper.

REFERENCES

[3] Branch and Sweeten. *Trans. Inst. Chem. E.*, 1949, 27.
[4] Kirkby and Morley. *Journal of the Iron and Steel Institute*, March, 1948.

TABLE 4a
Nitric Acid
(Loss in gms./sq. cm./24 hrs.)

Temperature	Concentration % HNO_3	Mild Steel	FI	S80	FDP	FCB	FML	FMB	254
20° C.	69.8 (sg. 1.42)	.0010	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	32.4 (sg. 1.20) ...	>.6	.0001	.0000	.0000	.0000	.0000	.0000	.000
	15	>.25	.0002	.0000	.0000	.0000	.0000	.0000	.0000
	5	.0572	.0014	.0000	.0000	.0000	.0000	.0000	.00000
	1	.0115	.0016	.0000	.0000	.0000	.0000	.0000	.0000
60° C.	94.1	—	—	—	.0010	—	—	—	—
	69.8	—	.0003	.0003	.0000	.0000	.0000	.0001	.0000
	32.4	—	.0001	.0001	.0000	.0000	.0000	.0000	.0000
	15	—	.0003	.0001	.0000	.0000	.0000	.0000	.0000
	5	—	.0016	.0001	.0000	.0000	.0000	.0000	.0000
	1	—	.0055	.0000	.0000	.0000	.0000	.0000	.0000
b.p.	94.1	—	—	—	.0080	.0067	—	—	—
	69.8	—	.0087	.0060	.0006	.0010	.0011	.0012	.0008
	32.4 ...	—	.0091	.0022	.0002	.0003	.0002	.0005	.0002
	15	—	.0050	.0006	.0000	.0001	.0000	.0002	.0002
	5	—	.0203	.0006	.0000	.0000	.0000	.0000	.0000
	1	—	—	.0001	.0000	.0000	.0000	.0000	.0000

TABLE 5a
Sulphuric Acid
(Loss in gms./sq. cm./24 hrs.)

Temperature	Concentration H_2SO_4	Mild Steel	FI	S80	FDP	FCB	FML	FMB	254
20° C.	95.6 (conc.) ...	.0010	.0022	.0026	.0000	.0000	.0000	.0000	.0000
	80	.0008	.0094	.0028	.0030	.0023	.0018	.0040	.0001
	65	.0012	.0153	.0179	.0060	.0072	.0093	.0050	.0001
	50	.1163	.2798	.3093	.1000	.0275	.0548	.0200	.0001
	35	.1380	.3930	.2080	.0500	.0062	.0140	.0040	.0000
	20	.0838	.4595	.1334	.0120	.0030	.0044	.0005	.0000
	10	.0518	.2526	.0572	.0020	.0010	.0005	.0000	.0000
	5	.0384	.1430	.0349	.0005	.0007	.0003	.0000	.0000
	2.5	.0290	>.075	.0247	.0001	.0007	.0000	.0000	.0000
	1	.0146	>.03	.0192	.0001	.0002	.0000	.0000	.0000
	0.5	.0127	>.015	.0151	.0001	.0000	.0000	.0000	.0000
	0.25	.0056	>.01	.0033	.0000	.0000	.0000	.0000	.0000
60° C.	95.6	.0030	—	—	.0012	—	.0021	.0020	.0001
	80	.0036	—	—	—	—	—	—	.0010
	65	.0077	—	—	—	—	—	—	.0008
	50	—	—	—	—	—	—	—	.0004
	35	—	—	—	—	—	—	—	.0002
	20	—	—	—	—	—	—	.0250	.0000
	10	—	—	—	.0200	—	—	.0050	.0000
	5	—	—	—	.0100	.0023	.0059	.0020	.0000
	2.5	—	—	—	.0010	.0021	.0021	.0002	.0000
	1	—	—	—	.0005	.0014	.0001	.0000	.0000
	0.5	—	—	—	.0001	.0013	.0001	.0000	.0000
	0.25	—	—	—	.0000	.0004	.0000	.0000	.0000
b.p.	95.6	—	—	—	.0143	—	.0105	.0600	.0267
	80	—	—	—	—	—	—	—	.0538
	65	—	—	—	—	—	—	—	.0923
	50	—	—	—	—	—	—	—	.0343
	35	—	—	—	—	—	—	—	.0436
	20	—	—	—	—	—	—	—	.0136
	10	—	—	—	—	—	—	—	.0072
	5	—	—	—	—	—	—	.0400	.0040
	2.5	—	—	—	—	—	.0145	.0150	.0033
	1	—	—	—	—	.0076	.0050	.0080	.0022
	0.5	—	—	—	.0060	.0047	.0036	.0030	.0009
	0.25	—	—	—	.0040	.0036	.0026	.0015	.0004

(Tables continued overleaf)

TABLE 6
Hydrochloric Acid
(Loss in gms./sq. cm./24 hrs.)

Temperature	Concentration % HCl	Mild Steel	FI	S80	FDP	FCB	FML	FMB	254
20° C.	20 ...	.0762	.2414	.1351	.0489	.0028	.0269	.0189	.0008
	10 ...	.0413	.2543	.0323	.0050	.0014	.0083	.0097	.0004
	5 ...	.0314	.1431	.0175	.0035	.0008	.0042	.0028	.0003
	2.5 ...	.0221	>.1	.0158	.0030	.0006	.0031	.0010	.0000
	1 ...	.0150	>.04	.0100	.0015	.0002	.0004	.0000	.0000
	0.5 ...	.0107	>.02	.0075	.0001	.0001	.0000	.0000	.0000
	0.25 ...	.0081	.0093	.0043	.0000	.0001	.0000	.0000	.0000
60° C.	20 ...	—	—	—	—	—	—	.5948	.0080
	10 ...	—	—	—	—	—	—	.2176	.0050
	5 ...	—	—	—	—	.0047	—	.0739	.0040
	2.5 ...	—	—	—	—	.0023	—	.0201	.0020
	1 ...	—	—	—	.0037	.0015	—	.0010	.0001
	0.5 ...	—	—	—	.0032	.0011	.0079	.0001	.0000
	0.25 ...	—	—	—	.0010	.0010	.0057	.0000	.0000
b.p.	20 ...	—	—	—	—	—	—	—	—
	10 ...	—	—	—	—	—	—	—	—
	5 ...	—	—	—	—	—	—	—	—
	2.5 ...	—	—	—	—	—	—	—	.0156
	1 ...	—	—	—	—	—	—	.0328	.0040
	0.5 ...	—	—	—	—	—	—	.0176	.0020
	0.25 ...	—	—	—	—	—	—	.0020	.0010

TABLE 7
Phosphoric Acid
(Loss in gms./sq. cm./24 hrs.)

Temperature	Concentration % H_3PO_4	Mild Steel	FI	S80	FDP	FCB	FML	FMB	254
80° C.	89 (sg. 1.75)	.0533	.0064	.0001	.0001	.0001	.0001	.0001	.0000
	80 ...	.4205	.0335	.0001	.0000	.0001	.0000	.0001	.0000
	65 ...	.7825	.6450	.1271	.0001	.0000	.0001	.0001	.0000
	50 ...	.8192	.6860	.2054	.0001	.0000	.0001	.0000	.0000
	35 ...	.4420	.3570	.1715	.0000	.0000	.0000	.0000	.0000
	20 ...	.2150	.0695	.0819	.0000	.0000	.0000	.0000	.0000
	10 ...	.1030	.0160	.0018	.0000	.0000	.0000	.0000	.0000
	5 ...	.0605	.0019	.0000	.0000	.0000	.0000	.0000	.0000
	2.5 ...	.0316	.0001	.0000	.0000	.0000	.0000	.0000	.0000
	1 ...	.0141	.0001	.0000	.0000	.0000	.0000	.0000	.0000
b.p.	89 ...	—	.6905	1.0700	.5000	—	.2510	.1226	.0084
	80 ...	—	.2712	.6455	.1000	—	.1705	.0500	.0012
	65 ...	—	.2284	.1251	.0500	.1000	.0592	.0350	.0010
	50 ...	—	.3465	.1581	.0100	.0050	.0020	.0015	.0007
	35 ...	—	.3660	.1262	.0001	.0002	.0000	.0001	.0000
	20 ...	—	.0648	.0337	.0001	.0000	.0000	.0000	.0000
	10 ...	—	.0174	.0005	.0000	.0000	.0000	.0000	.0000
	5 ...	—	.0028	.0001	.0000	.0000	.0000	.0000	.0000
	2.5 ...	—	.0003	.0001	.0000	.0000	.0000	.0000	.0000
	1 ...	—	.0002	.0001	.0000	.0000	.0000	.0000	.0000

TABLE 8
Acetic Acid
(Loss in gms./sq. cm./24 hrs.)

Temperature	Concentration % CH_3COOH	Mild Steel	FI	S80	FDP	FCB	FML	FMB	254
80° C.	100	.0477 —	.0097 —	.0215 —	.0023 .0041	— —	.0000 .0000	.0000 .0000	.0000 .0000
80° C.	80	— —	.0404 —	.0108 —	.0000 .0000	— —	.0001 .0000	.0000 .0000	.0000 .0000
80° C.	30	— —	.0412 —	.0085 —	.0000 .0000	— —	.0000 .0000	.0000 .0000	.0000 .0000
b.p.	100 (Glacial)	.0066 —	.0688 —	.0359 —	.0031 .0019	.0013 .0006	.0014 .0006	.0004 .0002	.0000 .0000
b.p.	80	.3560 —	.0618 —	.0193 —	.0036 .0021	— —	.0014 .0007	.0002 .0000	.0001 .0001
b.p.	30	.4640 —	.0966 —	.0496 —	.0050 .0005	.0064 .0026	.0000 .0000	.0000 .0000	.0000 .0000

(*These are abbreviated forms of the original tables, in which additional temperature stages are shown*)

(*Concluded*)

BRITISH WELDING RESEARCH

Work on Alloys and Aluminium

THE annual report of the British Welding Research Association for 1948-49 gives summarised particulars of the work accomplished during the year by its various ferrous and non-ferrous committees. This included, for example, research into the fundamental factors which cause cracking, in the case of ferrous metals, in the hardened zone adjacent to welded joints. Experiments on specially made alloys containing certain constituents such as manganese and sulphur in controlled quantities confirmed the inference drawn from the work on alloy steels, that the material found at the grain boundaries does consist of sulphides.

Work on a particular alloy steel during the year has been concentrated on the investigation of weldability tests which would simulate the conditions at particular parts of a welded structure, and there has been some indication that, given a certain degree of restraint, the dominant factor in causing cracking is the rate of cooling.

An investigation of the argonarc welding of aluminium was commenced during the year. In the first instance, particular attention has been given to investigating the electrical characteristics of the tungsten-aluminium arc in argon, and the influence of superimposed high frequency impulses. This work is being done in collaboration with the British Electrical and Allied Industries Research Association, and results are said to be encouraging.

Other research has included work on a wide variety of problems, including the fusion welding of a number of light alloys, the load carrying capacity of frame structures, the behaviour of welded structures under dynamic loading, projection and flash welding of steels, spot welding of low carbon steels, and many other matters.

New Aluminium Primer

A NEW process which is claimed to overcome the problems of painting aluminium effectively is announced. It introduces a new primer containing acid ingredients, special resins, and a corrosion-resisting pigment. It etches the metal surface, thus establishing a close adhesion.

The new primer can be supplied to a wide range of other metals and alloys. The process has been developed by the Tube Investments subsidiary, Drynamels, Ltd., and T.I. Aluminium, Ltd.

IMPROVED IRON CASTING

International Use of Spheroidal Form

THE widening adoption of the new form of strong malleable cast iron produced by additions of magnesium, as a result of which the graphite is present in the form of spheroids, is the subject of a comment by the Mond Nickel Co., Ltd. The new iron, which was derived from prolonged development work in the laboratories of the International Nickel Company and associates, has more than twice the strength of ordinary cast iron Its use for improving the conventional grey iron castings and for the replacement of malleable cast iron and even, in some cases, of steel and other alloys, is rapidly becoming established.

U.S. Patents Nos. 2,485,760 and 2,485,761, covering the new cast iron, have been granted recently to the International Nickel Company. Three British applications Nos. 630,070, 630,093 and 630,099, in the name of the Mond Nickel Company, have been accepted by the British Patent Office. Patent applications have been made in all other leading industrial countries, and have already been granted in, among others, Belgium, Italy and South Africa. Over 40 firms have been licensed to make the new iron in the U.S.A. and some individual foundries have cast as much as 100 tons in one day. Licences in Great Britain have been granted to the Sheepbridge Stokes Centrifugal Castings Co., Ltd., Robert Taylor & Son (Ironfounders), Ltd., Lloyds (Burton), Ltd., and W. A. Baker & Co., Ltd.

Increasing Molybdenum Yield

BECAUSE of the expansion recently completed at the Mackatica molybdenum mines, Jugoslavia looks forward to becoming one of the world's largest producers of molybdenum. One of the major problems connected with molybdenum mining at the Mackatica mine, that of removing the ore, has been solved by boring a three-mile tunnel from the foot of the hill which contains the deposits and connecting with the mine face by a 1800-ft shaft. Smooth and speedy transport of the ore will be assured. This is of particular importance during the winter, when the district becomes snowbound and the road impassable.

The shaft will also bring water from a nearby river for the hydro-electric plant which is to provide power for the electrification of mining operations.

Reduction of Sulphur in Iron and Steel

Recent Spanish Results

THE Spanish Iron and Steel Institute (Inst. del Hierro y del Acero) has encouraged a considerable amount of research into the effect of slag in the manufacture of steel. Study has been given to the possibilities of the Perrin process. A. Gimenez y Sanmartin, Bilbao, earlier, has described a method for rapid desulphurisation by using liquid slag previously prepared and of special composition. Further details have now been published (*DYNA*, 1949, ***24***, 117—121).

The author was induced to undertake these experiments by (*a*) lack of suitable scrap or other raw material; and (*b*) close contiguity in the same steel works of both Siemens and electrical furnaces. If treatment with specially prepared liquid slag proved satisfactory this would offer a means of using inferior raw material which, unfortunately, was often the only sort available in Spain.

It was clearly essential that sulphur content should be carefully controlled to conform with that of good quality Siemens steel, by frequent analyses and by mechanical and other tests, and finally by ascertaining how the steel behaved in actual use. It was also clear that there should be no microscopical or other abnormal inclusions.

Differing Slags

Several kinds of slag were tried and it was eventually found that a white creamy or fluid mixture was the best. Among other things, it did not affect the phosphorus content, except possibly to reduce it slightly. Carbon content remained fairly constant or was slightly reduced; silicon also was less, while managanese increased somewhat.

The slag or slag and steel was prepared in an electric Hercult furnace of 6-ton capacity. The proportion of slag used was about 3.5 per cent of the total steel cast, without taking account of loss or waste. Several melts were prepared from each furnace—electric and Siemens for mixing, of which some particulars, in the case of three of them, are given below, A, B, and C.

ANALYSES

					Steels		
		kg.	C	Mn	P	S	Si
A.	Electric	4745	0.36	0.30	0.016	0.008	0.22
	Siemens	21600	0.40	0.52	0.045	0.045	0.26
	Mixed		0.39	0.49	0.035	0.020	0.25
B	Electric	5259	1.49	0.21	0.027	0.008	0.17
	Siemens	21600	1.20	0.24	0.017	0.048	0.32
	Mixed		1.24	0.24	0.014	0.025	0.24
C	Electric	4750	0.74	0.27	0.027	0.008	0.27
	Siemens	21950	0.74	0.22	0.019	0.053	0.39
	Mixed		0.72	0.28	0.025	0.023	0.25

The Siemens steel was prepared in furnaces of the Mäerz type, basic and fixed, of 25 tons capacity heated by gas from Morgan generators, and de-slagged, not completely, by hand. The ferro-silicon was added a short time before tapping.

In view of the composition, fluidity, and temperature of the slag it is essential to have highly resistant refractories. The electric and Siemens furnaces must be suitably placed in relation to each other, and the right interval between tapping these must be chosen: five to ten minutes is generally most convenient.

The average figures for the twelve melts tested showed that the sulphur diminution was 42.77 per cent, of silicon 10.81 per cent, carbon 1.40 per cent, and of phosphorus 0.48 per cent. Manganese showed an average increase of 7.15 per cent.

Sulphur Analysis

In *ION* (1949, 9, 84-86) C. Berrens and R. Roig described a method of determining sulphur in iron and steel without the use of cadmium acetate, the latter having been almost unobtainable in Spain during the war. Their method is based on the use of potassium iodide and sodium hyposulphite solution, with suitable absorbent for hydrogen sulphide, the preliminary acid treatment being with HCl. The apparatus used is claimed to be better than that of Strohlein commonly used. That claim is not uniformly accepted in Spain.

SLAGS

Mixing		SiO_2	FeO	Al_2O_3	CoO	MgO	MnO	CaC_2	CaS	CaF_2	P_2O_5
A	Before	16.84	0.945	2.20	57.60	10.39	0.156	0.136	1.01	10.46	0.022
	After	27.26	1.197	5.76	44.86	13.41	0.630	0.042	1.05	5.50	0.034
B	Before	14.64	0.835	2.409	54.44	9.278	0.167	0.341	0.95	16.65	0.020
	After	27.76	0.814	5.68	44.55	10.92	0.387	0.10	1.40	8.18	0.020
C	Before	0.30	1.148	2.28	60.64	6.97	0.141	0.965	1.16	17.96	0.048
	After	24.00	0.944	4.96	49.97	9.91	0.464	0.059	1.01	7.88	0.057

ELECTROLYTIC DESCALING

Advantages Claimed for U.S. Tinplating Method

A UNIQUE feature claimed for the Bullard-Dunn electrolytic descaling and tinplating process is that the descaling bath, consisting of dilute sulphuric acid, uses a tin salt as inhibitor. The work is made cathodic in an electric circuit of high current density and, in consequence, as soon as scale or oxide is removed a fine layer of tin is depoited in its place.

This process was invented, developed and patented (U.S. patents 1,898,765 and 1,917,022) by the Bullard Company, of Bridgeport, Conn., U.S.A., and is thought likely to have wide use there when the present stringent retrictions on the use of tin in America are eased, states *Tin and Its Uses* (journal of the Tin Research Institute).

Among the advantages claimed for the process are: No etching of the tin occurs, and the racks also are protected by the tin film; the excellent throwing power cleans out recesses and holes; the bath produces chemically clean surfaces; the tin film protects the work after treatment; cleaning time for a variety of work can be uniform. The solution has long life; iron build-up is from scale only, not from the work.

The process is stated to lend itself to mechanical handling methods because surfaces easy to descale are protected from attack, while surfaces requiring longer treatment are being descaled.

There is claimed to be no permanent embrittlement because work is not etched and the hydrogen that is absorbed is reduced by standing or removed completely by mild heat [1 hr. at 290° F. (145° C.) or ½ hr. at 400° F. (205° C.)].

The Process

The operations include degreasing, rinsing, descaling and final wash. Degreasing is accomplished anodically, using a highly alkaline cleaner. The bath is operated at 6 volts with the temperature close to boiling and at a concentration of about 16 oz. per gal. The scale and oxide are removed cathodically in a bath containing dilute sulphuric acid, a small concentration of a tin salt and an addition agent to promote a uniform adherent deposit of tin.

The bath is run at a moderate temperature and high current density. The anodes are high-silicon iron except for one or two tin anodes, used to maintain the tin content of the bath. This bath is said to operate efficiently over a wide range of conditions.

When the bath has completed its function, the work is reported to be free from scale or oxide and is covered with a thin film of tin; no dimensional change has been effected.

The protective tin coating can be stripped very easily in a bath, operated as in the degreasing process, and the tin can be recovered. On the other hand, in practice, the tin coating is usually retained. It protects the surfaces during storage, it facilitates the "running in" phase, and it offers a particularly convenient surface for subsequent hot tinning, white metalling or painting.

Practical Test

One of the first demonstrations of the special value of a thin tin coating on steel, prior to painting, is stated to have been made by the William Bayley Co. on steel window frames cleaned on Bullard-Dunn equipment. The firm was looking for a better method of protecting steel window frames and realised that this was bound up with methods of cleaning, as well as methods of painting.

A number of steel window frames cleaned by various methods were compared. The method of testing was to paint the prepared specimens by a single dip and to subject them to various natural and accelerated weathering tests, including alternate immersion in 10 per cent sodium chloride solution and exposure to air.

The final evaluation was by visual examination. An elaborate system of grades of corrosion was devised and, as a number of different sets of specimens were examined and, as a uniform painting and corrosion practice had been observed for each set, the final averaged results provide a reliable picture of the comparative merits of each kind of pre-treatment.

The degree of corrosion may be seen from the following table:—

Percentage of specimens destroyed by corrosion

	Treatment before painting		
	None	Shot blasted and phosphated	Bullard-Dunn cleaned and tinned
after 600 hrs. ...	48 to 85	18 to 59	0 to 8
after 1,000 hrs. ...	97 to 98	41 to 66	8 to 28

Welding Research in the U.S.A.

A Comparison with British Methods

"THE major differences between the organisation of welding research in the U.S.A. and this country are that American research receives no Government support, and that industrial firms contribute to specific items of research rather than to the general funds of the Research Council. The other significant difference is that the U.S. Welding Research Council has no laboratories of its own, all work being directed by large committees comprising representatives of all those concerns contributing to the research, although the detailed direction is effected by working panels," said Dr. J. G. Taylor, director of research of the British Welding Research Association, in a lecture at a recent meeting of the Society of Engineers.

Dr. Taylor said that he had recently visited the U.S.A. and Canada with the object of establishing personal relations with the Welding Research Council of America, and in order to examine at first hand American welding research and production methods. The visit extended for a period of eight weeks and included visits to 17 universities and 26 industrial establishments.

Helium Arc Welding

Great interest, said Dr. Taylor, was being displayed in the U.S.A. in the process known here as Argonarc welding. In America it was known as Heliarc, or Heliweld, or "inert gas shielded arc welding," the reason for the difference being that in this country we were restricted to argon as the inert gas for shielding the electrode, whereas in the U.S.A. helium was also available.

The process was much commoner in the U.S.A. than in Great Britain, due to the appreciable difference in the price of inert gas. For automatic use helium was preferred owing to the difference from argon in the shape of the curves relating arc voltage to arc length. In the case of argon the curve was much flatter and therefore led to much less stability in arc length where this was automatically controlled by arc voltage.

Considerable attention was being given in the U.S.A. to resistance welding machines of the elaborate automatic type, in which parts were fed in and automatically welded together, either by spot welding or seam welding, in the machine. An example of this was a large machine used for fabricating silencers for aircraft engines, in which elliptical casings were fed in and conveyed through the machine on an endless belt.

At various stages, internal parts of the silencers were fed in at right angles to the direction of the conveyor belt and automatically spot welded in position. There were seven distinct parts to the silencer, and these were secured together by the operation of 96 welding guns. Some 500 silencer units were produced by this machine per hour.

A much simpler machine illustrated the same principle. Used for manufacturing cylinders, this machine was supplied and fitted with flat steel sheet of the appropriate size, which was rolled to cylindrical form and the longitudinal edges were seam-welded automatically. This machine was capable of producing 1500 cylinders per hour.

A process in which there had been greater activity in the U.S.A. than in England was that of pressure welding, which was used there to a substantial extent for joining oil pipe-lines and also in the construction of alloy steel underframes for aircraft.

Welding Research and Production

Most aspects of welding and its importance as an aid to increased productivity will be demonstrated at an exhibition to be held by the British Welding Research Association at its London headquarters, 29 Park Crescent, W.1, from February 7, 1950, to February 11, 1950.

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ULTRASONICS IN INDUSTRY

New Applications in Prospect

COMMERCIAL applications of ultrasonics to industrial processes, the possibilities of which in chemical and metallurgical operations are important, are brought nearer by the development of the new low frequency magnetostriction generator, which is the subject of a technical note by the electronic equipment division of Mullard Electronic Products, Ltd.

The first of its kind, the generator considerably widens the scope which was offered by the first commercial high frequency quartz crystal generator, which the company introduced earlier in the year for laboratory use.

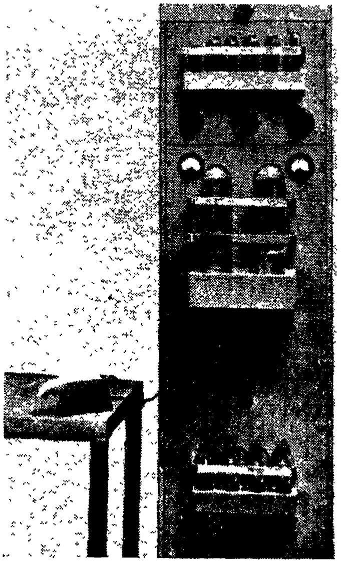
That generator is proving its value in ultrasonics research, especially in the treatment of extremely fine particles and bacteria, but the limitation of its power to 500 W precludes its successful use in production processes. The new magnetostriction generator overcomes this difficulty.

Standard generators so far have powers of 1 kW or less, and are intended primarily for experimental use, but there appears to be no limitation to the ultrasonic power that may be produced by generators of this class.

The Mullard low frequency ultrasonic generator consists of a main unit (a driving oscillator, power amplifier and low voltage d.c. power supply, with monitoring and check meters) and the transducer unit (a stack of nickel laminations wound with a common coil for excitation and polarisation). The amplifier, which provides the source of power for the transducer, is basically similar to that used effectively in public address equipment, and delivers a maximum output of 1 kW over a frequency range of 10 kc. to 25 kc.

The Magnetostriction Transducer

The industrial suitability of the equipment is associated almost entirely with the design of the magnetostriction transducer. The insulation of this is such that the whole unit may be immersed in conductive liquids without fear of damage or electrical shock. In practice, the transducer can quite easily be clamped against the side of the treatment bath. Alternatively, it can be fitted in a pipe junction, enabling the liquid to be treated as it flows over the actuating face. More compact and giving higher power outputs than previous transducers of the rod type, it can readily be produced to serve individual requirements. With simple cooling arrangements, a loading of about 5 W per sq. cm. can normally be used.



[Courtesy, Mullard Electronic Products, Ltd.

The tray mounted on the transducer (left) contains two normally immiscible liquids of which an emulsion can be made by the ultrasonic effect

The three equipments available now are: 1 kW, weight 448 lb.; 500 W, weight 432 lb.; and 250 W, weight 364 lb. All are 69 in. high by 20½ in. wide by 23 in. deep.

Reviewing some of the likely uses of the new equipment, the Mullard Company notes that it offers scope for work in the metallurgical field in the mixing of powdered and molten metals in alloy production. It is possible that the equipment could also be used for speeding up the process of solidification in molten tin and aluminium, and for the tinning of aluminium and similar metals.

Emulsification of a number of liquids, and the precipitation or dispersion of particles in suspension are further possibilities of ultrasonics. A certain amount of success has already been achieved in cleansing and washing applications, by which can be produced a much higher degree of cleansing.

WEST GERMAN HEAVY CHEMICALS

Output Now Approaching Pre-War Level

THE last three months of 1949 witnessed a successive improvement in the West German chemical industry, the production and sales crisis which caused much anxiety during the summer being now thought to have given way to a steady recovery which may enable the chemical industry as a whole to regain, in the early part of 1950, the pre-war output level. Export business, however, is still regarded as unsatisfactory.

Optimism About Exports

Hopes for an expansion of sales of finished pharmaceuticals and dyestuffs to Eastern Germany have not so far materialised. Moreover, the important negotiations with France have had to be broken off for the time being, and the prospect of export gains through the liberalisation of intra-European commerce is, as yet, rather vague. Under trade agreements concluded in 1949 chemical and allied exports from Western Germany should reach a total of $130 million, or eight per cent of all West German exports. In the light of the most recent export figures, this target appears to be very high.

West German potash sales in 1949 are estimated at 690,000 tons of K_2O, of which 560,000 tons were absorbed by the home market and 130,000 tons were shipped abroad. As reported earlier (THE CHEMICAL AGE, *60*, 220), the West German potash industry is making great efforts to open or re-open additional mines. During 1950 potash exports are to be doubled, while a home consumption of at least 800,000 tons is regarded as the minimum attainable in the conditions likely to prevail in the next few years.

The consumption of nitrogenous fertilisers in 1950 is estimated at 350,000 tons of N, a figure roughly in line with that of the last pre-war year. Production was recently running at 35,000 tons of N monthly, despite a slight falling-off in the supply of cyanamide. A substantial advance on the 1948/49 nitrogen production of 343,000 tons is therefore anticipated for the current agricultural year.

Badische Anilin- und Sodafabrik, Ludwigshafen, has announced that dismantling operations will not prevent the company from meeting all market requirements reaching it; the same appears to be true of other nitrogen producers faced with partial dismantling. The production of phosphatic fertilisers has been fluctuating of late, largely because of variations in the supply of basic slag for fertiliser purposes.

The production of inorganic heavy chemicals increased appreciably towards the end of 1949, with the exception of calcium carbide, which was affected by shortage of hydro-electric power. A comparison of the production in the Anglo-U.S. zone in the 12 months ended September, 1949, with the preceding 12 months' period reveals very substantial advances which are expected to go further in 1950, as follows (all figures in metric tons):—Sulphuric acid 827,000 (557,000), carbon disulphide 26,000 (14,000), soda ash 505,000 (325,000), caustic soda 205,000 (136,000), sodium sulphate 100,800 (78,600), potassium carbonate 135,900 (95,400), chlorine 57,900 (40,800), and calcium carbide 399,600 (327,800).

While, thus, considerable progress has been made in raising output, a reduction of production costs is now considered to be urgently required. The production of sulphuric acid will have to be increased substantially in 1950 to meet growing demands from fertiliser plants, rayon factories, petroleum refineries, etc.

Exports and Surpluses

Carbon disulphide is being produced in sufficiently large quantities to permit a resumption of exports. The output of caustic soda and soda ash is slightly above the pre-war level, while the production of sodium sulphate has made such great progress that substantial stocks have accumulated. The production of potassium carbonate began in Western Germany only in 1947 but is now sufficient to meet all local needs Small tonnages of calcium carbide have already been exported, and a further increase in demand is expected to result from the proposed expansion of cyanamide production.

The coal-tar distillation industry will soon have as large quantities of crude coal-tar at its disposal as before the war, when (1936) 1.1 million tons of crude tar and 800,000 tons of crude benzol were produced in Western Germany, chiefly in the Ruhr area. To cope with the large demand for methanol, the hydrogenation plant at Wesseling has been converted to

(*continued at foot of facing page*)

INDIA'S SALT PROBLEMS

Conflicting Demands for Expansion and Nationalisation

PROJECTS in India to modernise and enlarge the salt-producing industry have derived greater urgency from the cessation of supplies from Pakistan, caused by the disparity of currencies which has stopped trade exchanges.

The Salt Advisory Committee of the Government of India has agreed that the country must attain self-sufficiency in salt by the end of 1951. The Salt Controller, Mr. D. N. Mookerjee, accordingly held a conference with the Indian Salt Manufacturers' Association in Bombay to plan for increased production next year.

Mr. Mookerjee revealed that all the manufacturers on the west coast of India, except the representative of the Kandla Salt Works, had agreed to step up production by about 186,000 tons. Moreover, the Bombay Salt Manufacturers' Association had undertaken to meet the deficit of the Calcutta area by about 28,000 tons, hitherto imported from Kathiawar.

The Kandla works, claimed to be one of the largest private salt factories in India, with a production of about 66,000 tons annually, could not join the expansion scheme, it was pointed out, because the Government's proposal to expand Kandla as a port was likely to involve partial abolition of its works.

The deficit of 74,000 tons of rock salt from Pakistan would be made up by increased production, which had been planned in the Government salt factories at Sambhar and Kharagodha as well as those at Kuda under the Saurashtra Union. The balance of 46,000 tons, it was hoped, would be made good by the east coast manufacturers at Tuticorin.

Plans to nationalise the salt industry are being discussed by the Government of the United State of Travancore and Cochin. It is proposed to take over the factories under the Salt Act by cancelling licences and paying a nominal compensation, while stocks of salt would be paid for at the rate agreed under the penalty clause.

Protests

Compensation for the four factories to be taken over is reported to be Rs.300,000. The factories in Travancore are held on leases granted by the Government for a period up to 50 years. In several cases leases have still five to 25 years to run.

Protests against the suggested nationalisation have been made by the South Travancore Salt Development Association, which states that it has received no notification of the Government's intentions.

The salt industry in Travancore, the association emphasises, is now self-sufficient in its requirements, owing to private initiative and enterprise. Large capital has been invested and a reversal of the Government's policy would have serious repercussions on industry in general.

It is also reported that the Government of India has urged the premier of the United State of Travancore and Cochin to stop any further acquisition proceedings until the full effects of compensation and other problems on the general policy of the senior Government can be considered.

Three French salt experts, Messrs. Du Crest, D. B. Hennerick and J. Bochet, have arrived in Calcutta from Paris to investigate the establishment of a modern salt factory at Contai, on the coast of the Midnapore district.

Climate, salinity of the sea water and conditions of the salt will be examined. The area was surveyed some time ago.

WEST GERMAN HEAVY CHEMICALS

the production of this; output is at a rate of 25,000 tons annually.

The synthesis plant in the French zone has also resumed operations, with the result that considerable tonnages can now be exported, although the home demand has increased appreciably.

The West German production of plastics, which suffered from the uncertain prospects during the summer, is estimated at 60,000 tons for 1949, compared with 250,000 tons in the whole of Germany in 1944, and at 50,000 tons if cellulose and casein derivatives are left out of account. The continued ban on the production of buna rubber in face of the suspension of dismantling operations may result in an increase in the plastics production.

Chemische Werke Huels has announced that some of the plant originally earmarked for dismantling and now retained will be used for making styrol, vinyl chloride and di-chlor-ethylene derivatives, copolymers of vinyl chloride and vinyl acetate, special solvents and also detergents and chemicals for the textile industry.

· PERSONAL ·

MR. STANLEY W. WHIFFEN, who has been managing director of Whiffen & Sons, Ltd., since 1934, retired on December 31. He will, however, remain on the board of British Chemicals and Biologicals, Ltd. Mr. Whiffen is a member of the council of the Association of British Chemical Manufacturers. MR. L. H. BUTTS will succeed him as managing director of Whiffen & Sons, Ltd.

The following officers were appointed at the executive committee meeting following the annual general meeting of the Association of Cellulose Lacquer Manufacturers:—MR. P. N. CREES, chairman; MR. D. MASSIE, vice-chairman; MR. R. OWEN, hon. treasurer.

MR. M. GORDON, of the chemical research division at Fort Dunlop, has just obtained his Ph.D. in the Faculty of Science (Chemistry) at London University, in work carried out privately and under the Dunlop Rubber Company's auspices. He is now investigating the physical chemistry of rubber.

MR. E. J. DYOTT, assistant analyst at the Acton factory of T. Wall & Sons, Ltd., has been accepted as an Associate of the Royal Institute of Chemistry.

PROF. J. D. BERNAL left England by air recently for New Delhi, to attend the Indian Science Congress.

Having completed 53 years' service with the company, MR. GEORGE LIVINGS, works manager at Dunlop's, Manchester, has retired and has received from his colleagues a television set as a parting gift. He helped in the manufacture of some of the first pneumatic tyres when he was employed by William Warne, London.

The following appointments in the Colonial service were recently announced: L. R. VERNEY, chemist assayer, Nigeria, and F. R. JOHNSON, formerly analytical chemist, Gold Coast, to be senior fisheries officer, Gold Coast.

MR. J. M. KIRKNESS, has been appointed assistant secretary (export) of the Association of British Pharmaceutical Industry. Mr. Kirkness formerly held an executive position on the staff of the Wellcome Foundation, Ltd.

DR. J. T. MARTIN, plant pathologist, is one of two British scientists who are to spend three months in the U.S.A. to study recent developments there in the use of insecticides and fungicides. The tour is sponsored by ECA.

Mr. R. Greenwood, chairman of the Pharmaceutical Export Group, said on December 29 that when the new health scheme was introduced the industry estimated that there would be a 25 per cent increase in demand. The increase had, in fact, been nearer 40 per cent.

Loss to Plant Export Industry

MR. NORMAN NEVILLE, O.B.E., director of the British Chemical Plant Manufacturers' Association and the British Food Machinery Manufacturers' Association, died in hospital in London on Saturday last, 1949, at the age of 57, following a fall at his home.

His early business life was spent with electrical and engineering companies in Australia, Russia and the U.S.A. He became associated in 1940 with the export group movement, in which he made his most valuable contribution in national affairs. He first organised the export groups for food processing machinery and later food machinery and chemical plant and paint, ink and allied trades machinery. In 1943 he was appointed director of the BCPMA and of the Food Machinery Industrial and Export Group and at the same time became a director of the Dairy Engineers' Association.

Since the end of the war, Mr. Neville had travelled in India, South Africa and Scandinavia, with fruitful results for his associations. He was one of those who saw early the vital importance of trading with the Western Hemisphere and in 1948 he visited South and Central America and later in that year was closely concerned with the organisation of the Gilpin Mission to Canada and was the author of the plan for group representation in dollar markets, which has now been adopted by the Government.

He was a member of the Grand Council of the Federation of British Industries, of the Federation's Export Advisory Committee and chairman of the Export Committee of the British Engineers' Association.

◆ HOME ◆

Limited Lead Exports

The Board of Trade invites applications before January 28 for export licences to permit the export of a limited quantity of low-conversion manufactures of lead and lead compounds.

New Flintshire Cement Plants

Shortage of cement in Wales may be alleviated when the first unit of a new plant at Padeswood, Flintshire, is brought into production early in the New Year. Quarrying for raw material is proceeding satisfactorily, and a second unit is expected to be producing in March.

Dunlop Buy a Reckitt & Colman Works

The Dunlop Rubber Co., Ltd., has purchased the works of Reckitt & Colman, Ltd., Walton, Liverpool, adjacent to the Dunlopillo factory there. Provision has been made to afford suitable employment for those now employed at the Reckitt & Colman works.

New Protein Product

Glaxo Laboratories, Ltd., has announced the introduction of a soluble protein food, calcium salt of milk casein, said to be of high nutritional value. It is prepared by a process of roller drying which produces a fine, odourless powder that can be readily used in invalid or everyday meals without affecting their flavour or texture.

Zinc Prices Rise

The price of good ordinary zinc was increased by £2 from £85 10s. to £87 10s. per ton delivered, as from December 30. Prices of other grades increased accordingly. The zinc oxide manufacturers announced that from the same date, the price of zinc oxide, in lots of not less than two tons, delivered, was increased by £1 15s. New prices for zinc oxide were: Red Seal £84; Green Seal £85 10s.; White Seal £86 10s.

Chemical Employment

An increase in the number of persons employed in the chemical and allied trades in Great Britain in October was shown in the latest issue of the *Ministry of Labour Gazette*. The total of 444.1 thousand was 3.1 thousand more than September and 23.2 thousand more than the figure for mid-1948. Chemicals and dyestuffs employed 200,7000, compared with 199,100 in September.

Increased Wages for Chemical Workers

The 172,000 workers in the " chemica and allied trades " industry group r ceived during the first 11 months of 194 net increases in weekly wages amountin to £88,300, states the *Ministry of Labou Gazette*.

Hogmanay

Scottish plants closed down for the Nev Year on December 30 and in some case remained closed until the following Thursday. Most firms made emergency sta arrangements for a skeleton service durin the holiday.

High Pressure Tubing

In the news item relating to alloy stee tubing, for which the extreme pressure o 10,300 p.s.i. at 1000°F. is claimed (Th CHEMICAL AGE, *61*, 677)), the exterior surface quoted in the third paragraph was inadvertently printed as 25/32 in. Thi should have read 4 25/32 in.

New Coal Divisions

The reconstitution of the Northern Division of the National Coal Board into two distinct areas with two boards took effect on January 1. The Durham area will be administered by a Durham Board (chairman, Mr. E. H. D. Skinner) and Northumberland and Cumberland by a Northern Board (chairman, Mr. James Bowman, a vice-president and secretary in a miners' union).

Steel Production Records

Record output was reached by 14 steelworks, members of the South Wales Steel Association, during the week ended December 17. The aggregate output during the week was 33,635 ingot tons. Individual records for ingot production were set up at the two steel works owned by the Briton Ferry Steel Company, where 6036 tons were produced, and at Associated Steel Mills—5346 tons.

Barium Salts Prices

Among the changes in price of various chemicals which became effective as from January 1, 1950, were barium carbonate (precipitated) which rose from £25 15s. per ton delivered, 2-ton lots, to £27 5s. per ton. Barium sulphate (dry blanc fixe) precipitated was increased by £3 per ton, to £29 10s., delivered, 4-ton lots, and £29 15s., delivered, 2-ton lots.

Next Week's Events

MONDAY, JANUARY 9

The Royal Institute of Chemistry

Hull: Royal Station Hotel, 7.30 p.m. R. W. Moncrieff: "Olfaction and Odour."

Institute of Packaging

Manchester: Grand Hotel, 6 p.m. A. F. Cowan (The Metal Box Co., Ltd.): "Standardisation as a Means to an End."

TUESDAY, JANUARY 10

Institution of Works Managers

Huddersfield: George Hotel, 7 p.m. H.M. District Inspector of Factories, Huddersfield: "Recent Amendments to the Factories Act and General Safety."

Incorporated Plant Engineers

Manchester: Engineers' Club, Albert Square, 7.15 p.m. "Routine Inspection and Maintenance of Industrial Refrigeration Plant."

WEDNESDAY, JANUARY 11

The Chemical Society

Eire: Dublin, University College, 7.45 p.m. Prof. E. R. H. Jones: "Some Problems in the Chemistry of Vitamin D."

Society of Chemical Industry

London: 11 Chandos Street, Cavendish Square, W.1, 2.15 p.m. Joint meeting of the Microbiological Panel of the Food Group with the Society for Applied Bacteriology. "The Hygiene of the Preparation and Service of Food."

Incorporated Plant Engineers

Nottingham: Welbeck Hotel, 7 p.m. A. Thwaite: "Maintenance of Hand-Operated Pulley Blocks."

Institute of Fuel

Manchester: Engineers' Club, Albert Square, 2 p.m. A. Ridings: "Considerations Affecting Choice and Design of Boiler Plant."

Northampton Polytechnic

London: St. John Street, E.C.1, 7 p.m. First of a course of lectures on "Modern Developments in Metal Finishing," arranged under the auspices of J. E. Garside, head of the department of applied chemistry.

Institute of Physics

Edinburgh: Heriot-Watt College, 7 p.m. G. T. Winch: "The Measurement of Light and Colour."

THURSDAY, JANUARY 12

The Chemical Society

Dundee: University College, 5 p.m. R. P. Bell: "Keto-Enol Equilibrium."

Oil and Colour Chemists' Association

London: Manson House, 26 Portland Place, W.1, 7 p.m. F. W. Stoyle: "Relation of Paper and Ink in Printing."

Illuminating Engineering Society

Manchester: Reynolds Hall, College of Technology, 6 p.m. F. G. Copland: "Analysis of Lighting Problems in an Industrial Undertaking."

Institute of Physics

London: University College, Gower Street, W.C.1, 6 p.m. Discussion, introduced by Col. H. T. Jessop: "Compensator Methods of Measurement of Relative Retardation in Thin Sections of Photoelastic Models."

The Pharmaceutical Society

London: 17 Bloomsbury Square, W.C.1, 7.30 p.m. J. M. Rowson: "Genetics, Cultivation and Pharmacognosy."

FRIDAY, JANUARY 13

Oil and Colour Chemists' Association

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Dr. J. E. Arnold: "Practical Value of Rheological Measurements to the Paint Technologist."

Institution of Works Managers

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Miss Joan Woodward: "Some Problems of the Physical and Psychological Environment of Work."

Sir John Cass Technical Institute

London: Jewry Street, Aldgate, E.C.3, 6.30 p.m. J. B. Elks and B. A. Hems (first of series of eight lectures): "Recent Developments in the Chemistry of Vitamins and Analgesics."

SATURDAY, JANUARY 14

Institute of Physics and Institution of Metallurgists

Birmingham: University. First of a series of 24 lectures to be given on Saturday mornings, "Modern Views of the Solid State," opening with an introduction to wave mechanics by F. R. N. Nabarro, followed by J. F. B. Randles on non-metallic solids and B. A. Bilby on metals and alloys.

Raw Materials Directorates

It is officially announced that the work of the mica, rubber and sundry materials directorates will be amalgamated from January 2, 1950. The remaining functions of the present separate directorates will be carried out from that date under the title of the Directorate of Sundry Materials. The address will continue to be Empire House, St. Martin's-le-Grand, E.C.1.

• OVERSEAS •

Gasification Plant for Melbourne

To purchase and erect a Lurgi brown coal gasification plant in South Melbourne, the Metropolitan Gas Company (Australia) is to receive £A1 million as a loan from the Victorian Government. Gross capacity of the plant, which should be in operation towards the end of 1952, is to be 7.5 million cu. ft. of gas daily.

New Excavators for Australian Coal

The first of three giant " walking " excavators, purchased from the U.S.A. by the Australian Coal Board, has arrived in Sydney, New South Wales. It is claimed to shift 12 cubic yards of overburden a minute. In continuous operation over a 5-day week the machine is capable of removing 8.5 million cubic yards of overburden a year.

Vegetable Oil Refining in Ceylon

A scheme estimated to cost £550,000 for the refining and manufacture of vegetable oils has been approved by the Ceylon cabinet. It is hoped to produce a high yield of oil and oil cake from copra by solvent extraction. Oil is also to be extracted from mechanically expelled poonac which contains about six per cent oil, and the fatty acid used for conversion into glycerine and fatty alcohol.

New Cellulose Acetate Cement

A new liquid cement for bonding cellulose acetate, more efficient and less harzardous than acetone, has been developed by the Schwartz Chemical Company, Inc., New York City. " Acetate Cement " is said to be far less volatile than acetone, does not require a U.S. fire department permit, and can be stored safely in unlimited quantities. The new mixture is reported to evaporate slowly enough to ensure good penetration and bond.

New Rust Inhibitor

A new rust inhibitor for light oil products in pipe lines and static storage is offered in the U.S.A. by the Monsanto Chemical Co. A hydrocarbon-soluble, water-insoluble, non-metallic organic material, the new product is Santolene C and is intended to be used in such products as petroleum, fuel oil and kerosene. It is effective at a dosage of 0.002 per cent by weight (0.75 gal. per 1000 barrels) with distilled water and 0.01 per cent with sea water. Concentrations up to 0.01 per cent have no undesirable effects on petroleum, kerosene and No. 2 fuel oil.

Du Pont's 5000 Patents

The United States Patent Office reports that E. I. du Pont de Nemours & Company has made 730 of its patents available to other companies. The company now has about 5000 patents on the register of patents available for licensing or sale.

Refinery Project in Australia

Preliminary surveys have been made at Geelong, Victoria, by the Shell Company of Australia, Ltd., prior to the building of a refinery at an estimated cost of £A1.5 million. Crude oil from sterling areas will be refined to produce, principally, bitumen, fuel oil and lubricants.

Swedish Brewery Technique

Production of yeast containing exceptionally large quantities of fat, from molasses and other sugar containing materials is reported to characterise the special yeast culture developed under Prof. H. Lundin at the Institute of Yeast Fermentation Science of Stockholm's University of Technology.

U.S. Bauxite Production

Production of bauxite in the U.S. mines in the third quarter of 1949 totalled 206,807 long tons (dried equivalent), compared with 291,604 tons in the second quarter. This, a decrease of 29 per cent, was the lowest output figure for any three-months' period since the first quarter of 1946.

Cellulose Plant for Chile

Negotiations between the International Bank for Reconstruction and Development and the Chilean Corporación de Fomento de la Producción (the Industrial Development Corporation) for the grant of a loan of U.S. $7 million for the construction of a cellulose factory are said to be well-advanced. The building of a plant capable of supplying requirements of the country's paper factories is expected to take two or three years.

New Swedish Insulating Glass

The first Swedish glass down may soon appear in the market, according to statements in the Swedish Press. Producers are the Billesholm-Höganäs concern, South Sweden, who have been manufacturing glass wool for insulation purposes for the past 20 years. The new Swedish product is stated to be an advance on present European types. Glass down is stated to have very much better insulating properties than glass wool.

FREER EUROPEAN TRADE

France Lifts Some Restrictions

REMOVAL of import restrictions on many commodities was announced by the French Government last week, and an official list was published in the *Journal Officiel*.

The exemptions, which will become effective before the end of the year, are in accordance with the OEEC decisions in November last to liberalise European trade, and follow the recent relaxations announced by the British Government (The Chemical Age, *61*, 868).

The special list of products originating from Great Britain on which import quotas have been removed includes the following chemical commodities:—

Fats and oils of fish and marine animals, whale oil (hydrogenated), sulphur, graphite (natural and artificial), barytes (sulphate of barium, etc.), barium peroxide, mica, refractory earths, bentonite (natural), nitrogen, arsenic, antimony, radioactive metals, rare-earth metals, hydrofluoric acid, non-metallic fluorides, sulphurous anhydride, arsenic acids, boric acids and anhydrides, other inorganic acids, etc., strontia, magnesium (pure), oxides of zinc and oxides and hydroxides of cadmium and aluminium, aluminium (cast), oxides of manganese, iron, nickel and oxides and hydroxides of cobalt; tungsten trioxide, vanadium pentoxide, oxides of tin, copper, mercury and lead; fluorides and fluosilicate, chlorides, (with the exception of barium chloride) and oxychlorides, sodium chlorite, chlorates, perchlorates, bromide (bromates, iodides, etc.), hydrosulphites, hydrosulphates, sulphites, nitrites, nitrates (with the exception of nitrates of ammonium, sodium, calcium, potassium, other than for agricultural use), hydrophosphites, and phosphates, arsenites, arsenates, and antimonate, precipitates of calcium carbonate, barium carbonate, magnesium cabonate; ferrocyanide, ferricyanide, silicates, borates, zincates, aluminates, manganite and manganates, molybdates, tungstates, vanadates, etc.

Hydrocarbon (cyclanique), allyl alcohol, citronellol, linalool, rhodinol, methyl ethers, phenyl oxide, anethol, polyphenol ether oxides, aldehydes and their derivatives, quinones.

Formic acid and acetic acid and their salts and esters, methyl acid, amyl and glycerine acetate, acetyl chloride, stearic acid, palmitic acid, trichloroacetic acid, monobromacetic acid, sulphuric esters, acyclic amines, indoles, pyridines, etc., diastase.

Pharmaceutical products and products of wood distillation.

Tannic acids, tannins, colouring matters, animal, vegetable and mineral with the exception of lithopone.

Dyes (prepared), mastics and coatings not classified, colours (pigments), colours for ceramics.

Essential oils and essences (with the exception of jasmine oil).

Chemical products prepared for photographic use.

Chemical derivatives of rubber.

Customs duties have, however, been re-imposed on a number of commodities, which include the following:—

Alginates and their derivatives, chromates (except lead and zinc), malic acid, chemical machinery (except rubber), machines and apparatus for testing, disinfectant preparations, insecticides, fungicides, herbicides, etc., phosphoric acid, peroxide of hydrogen, caustic soda and caustic soda lye, chrome oxides and hydroxides, cobalt oxides and hydroxides, barium chloride, sodium hypochlorite and potassium hypochlorite, ammonium nitrates, etc., phosphates, amino-acids, synthetic tanning products, lithopone.

LIMITING DIVIDENDS

"No Prosperity without Profits"

THE failure of three principal federations of commercial interests to offer resistance to the continued "voluntary" limitation of dividend payments has been castigated by Sir Ernest Benn, reviewing the situation which the country faces as it enters the mid-point of the 20th century.

"We start 1950 sadder, wiser and much poorer," writes Sir Ernest Benn in a letter to the *Daily Telegraph*. "The dream of the Planners' Paradise is passed and we wake to wholly new conditions. Our credit gone, our pound despised, the sellers' market ended, American assistance frittered away, and our meagre rations scraped together by clumsy primitive barter."

Recalling that the General Council of the TUC had taken up the chorus, calling for lower profits and still higher taxes, Sir Ernest Benn observes: "It is the bounden duty of these federations and associations, instead of pandering to the TUC, to proclaim from the housetops the faith that was in them, and tell our anxious people what they are yearning to hear. That there can be no prosperity without profits; that profits are the reward of good service and the proof of proper economy; that all new enterprise must spring from profits; that high wages, low prices and high profits are the trinity of sound economics; and that the only hope of survival is in the rehabilitation of an active business class, encouraged to lead us forward by the prospect of prizes commensurate with the personal risks and strains involved. Taxation at the higher levels must be so reduced as to leave the prizes within reach of the runners."

Limited Exemptions by Norway

NORWAY's extended list of commodities freed from import duty was also submitted to the OEEC last week.

The list was divided into three groups—foodstuffs, raw materials, and processed goods. Of the foodstuffs, 50.4 per cent are freed, and 67.5 per cent of the raw materials.

Among processed goods, however, Norway has been able to free only 44 per cent, instead of the 50 per cent stipulated by the OEEC. Full reasons are given in a memorandum forwarded by the Norwegian Government to Paris.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Crown Chemical Co., Ltd., Lamberhurst. (M., 7/1/50.) November 25, £2700 further charge, to National Provincial Bank, Ltd.; charged on Stair House, Lamberhurst, together with the block of flats & shops near thereto, and land forming part of Court Lodge, Lamberhurst. *£3300. December 28, 1948.

Walter Preston, Ltd., Leeds, manufacturing chemists. (M., 7/1/50.) November 22, charge, to United Legal Collecting Society securing £2000 and any other moneys, etc.; charged on factory, land and buildings, known as Sydenham Works, Sydenham Street, Leeds. *Nil. December 19, 1947.

Silverwood Chemicals, Ltd., London, S.W. (M., 7/1/50.) November 29, mortgage and charge, to National Provincial Bank, Ltd., securing all moneys due or to become due to the bank; charged on leasehold premises at Mandrell Road, Brixton, with plant, fixtures, etc., and a general charge. *Nil. December 31, 11948.

Satisfaction

Inertol Co., Ltd., Hull, chemical manufacturers, etc. (M.S., 7/1/50.) Satisfaction, December 3, of mortgage registered September 15, 1947.

Company News

Change of Name

The Czechoslovak Chemical Works (London), Ltd., is now known as Chemical Commodities, Ltd., 35 Pont Street, London, S.W.1. Telephone: SLOane 0674/5.

Evans Medical Supplies

An interim dividend of 3 per cent, less tax (same) on the ordinary stock has been declared in respect of the 12 months ending December 31, 1949.

Pest Control

A dividend of 7½ per cent on the ordinary stock for the nine months to September 30, 1949, is announced by Pest Control, Ltd. The group profit, before tax, was £100,676, including £7095 recovered from provision made in 1948.

New Registrations

Bleep Products Company, Ltd.

Private company. (476,436). Capital £100. Manufacturers of chemicals, minerals, gases, etc. Directors: B. Shepherd, M. H. Egremont, and J. Egremont. Reg. office: 154 Stafford Road, Wallington, Surrey.

Wilfred E. Dale, Ltd.

Private company. (476,551). Capital £1000. Manufacturers of chemicals, gases, etc. Directors: R. W. Stangroom, E. A. M. Gee. Reg. office: 27 Market Place, Andover, Hants.

Granville Chemical Co., Ltd.

Private company. (476,394). Capital £2000. To acquire the business of chemical manufacturers heretofore carried on by Granville Chemical Co. Directors: G. E. Lord, and R. Lord, D. Williamson and L. Williamson. Reg. office: 15 Market Street, Keighley.

Ceylon Copra Prices

THE Government of Ceylon has revised its policy on the export of coconut products. The market does not revert to entirely free trade, but, it is believed, there will be no guaranteed prices to producers. (The Chemical Age, *61*, 781.)

The export of coconut products will, however, still be subject to licence and the Commodity Purchase Department will continue to function, purchasing copra at its existing depots at prices prevailing in the market in Colombo.

The new increased duties, per ton, are: Rs.150 for copra, Rs.243-75 for coconut oil. Duty on fresh coconuts is Rs.84 per thousand.

The producer has, hitherto, been getting Rs.150 per candy for copra, and the price under the United Kingdom contract was £55 per ton. The free world price for sterling copra is about £80 a ton.

The immediate effect of the new regulations is that coconut producers have been offered as much as Rs.240 per candy for copra by shippers.

The Stock and Chemical Markets

STOCK markets made a firm opening in the New Year, business in most sections tending to improve, although British Funds were lower, owing to falling off in demand. The view prevailing in the City is that the General Election is likely to be held before the April Budget; and there is already talk of an advance in industrial shares on the possibility of a change of Government.

Movements in the chemical and allied sections were mostly small. Imperial Chemical, after changing hands around 43s., eased to 42s. 7½d. Albright & Wilson were 29s. 6d., Monsanto 51s., Fisons 26s. 9d. and Boake Roberts 25s. 6d. Elsewhere, Amber Chemical 2s. shares were 4s. 6d., F. W. Berk 13s. and Bowman Chemical 4s. shares again around 6s. Brotherton 10s. shares were 19s. 3d. and Pest Control 5s. shares changed hands around 8s. 6d. In other directions, L. B. Holliday 4½ per cent preference were 19s. 9d. and British Chemical & Biologicals 4 per cent preference 18s. 6d. Laporte Chemicals 5s. shares changed hands around 9s. 4½d. Dunlop Rubber eased to 62s. 9d., Turner & Newall to 74s. 6d. and United Molasses to 41s. In general, these movements have not exceeded more than a few pence. Although competition is increasing, the prevailing market view forsees good prospects of chemical and allied companies maintaining their dividends in 1950. Yields on this basis are good in most cases.

The recent statement by the FBI indicates that, even if there is a change of Government, the policy of restraint in dividend payments would be generally continued. Consequently, the City is not taking the view that any change in dividend policy by leading industrial companies is in prospect during the current year. Nevertheless, it is assumed that a change of Government would bring reduction in taxation and abolition of many controls. It is realised that interest rates are likely to trend upwards.

Lever & Unilever have been more active around 44s. 3d., British Aluminium remained at 41s., British Oxygen were firm at 90s. 9d., with Amalgamated Metal at 17s. 10½d., and General Refractories 23s. 1½d. British Xylonite eased to 58s. 9d. Otherwise, shares of companies connected with plastics have been steadier. British Industrial Plastics 2s. shares were steady at 4s. 9d., helped by the financial results. De La Rue changed hands around 23s. 3d., and Kleeman 1s. shares were 8s. Borax Consolidated have been more active around 57s. 6d.

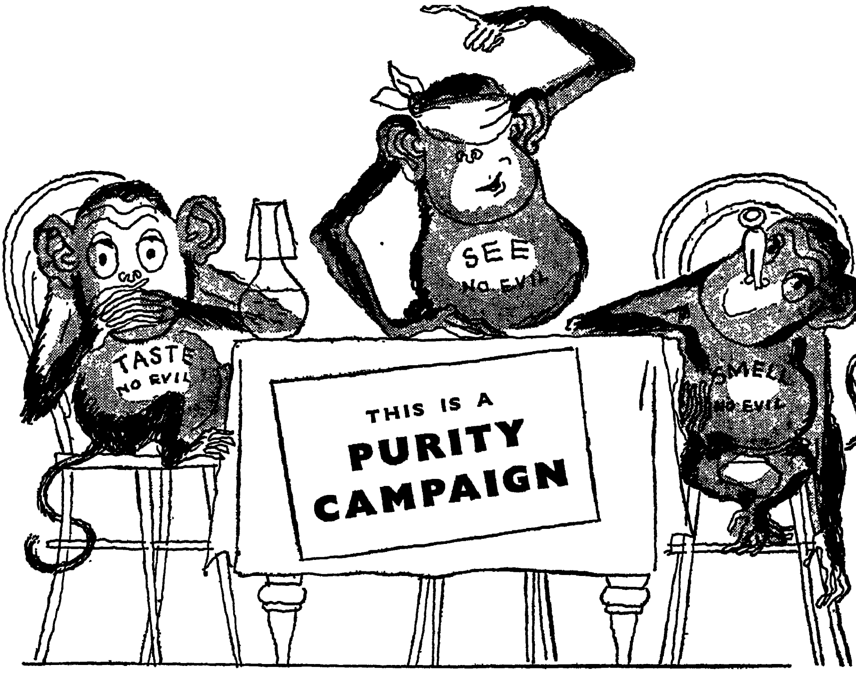
Boots Drug were 50s. 3d., Beechams deferred 15s., and Sangers 24s. Iron and steels held firm, Dorman Long at 31s. 9d., United Steel 27s. 9d., and Stewarts & Lloyds 53s. 3d. Glaxo were active around 46s. 9d. " ex " the share bonus. The 4s. units of the Distillers Co. were 17s. 3d., and Associated Cement firm at 78s. 3d. Oils remained easier, perhaps in recognition of the possibility of lower oil prices. Shell eased further to 65s. 7½d., and Anglo-Iranian to 6 25/32.

Market Reports

THE past week has witnessed the renewal of active trading conditions in the industrial chemicals market. A fair amount of new contract business has been placed and interest is by no means confined to any one section of the market. Export inquiry is again on a good scale and it is confidently expected that the recent increase in chemical exports will be maintained. The general price position continues steady and at the time of this report no further price changes have been notified. However, the undertone remains strong. There is little of interest to report about the coal tar products. The toluols and pyridines have been in fair request and there has also been a steady demand for creosote oil, but cresylic acid remains a dull market.

Manchester.—Trading conditions on the Manchester chemical market during the past week, although not yet back to normal, have been livelier than they have been since before the break for the Christmas holidays. It is likely to be several days yet, however, before the movement of supplies into actual consumption is on the pre-holiday scale and before new buying gets into its stride. The undertone of the market is firm generally and, from the beginning of the present week, advances have been shown in the sulphides of soda, percarbonate of soda, and both blanc fixe and precipitated carbonate of barium.

Glasgow.—Apart from the continued acute shortage of xylol, no feature of interest has been observable in the Scottish chemical market, buying having been on a very small scale on account of the New Year holiday. The export market also is quiet.



When it comes to foodstuffs and beverages and beauty preparations, to mention only a few products, you can't be too careful. So we're campaigning on behalf of that amazing stuff called Active Carbon. It can remove unwanted flavours and odours. It can de-colourise or improve colour. It simplifies crystallisation. It cleans precious liquids and gases. In short, it can and does improve the quality and attractiveness of many products in everyday use.

Anybody in the audience who wants to find out more about it should get in touch with the Active Carbon specialists.

SUTCLIFFE SPEAKMAN

SUTCLIFFE SPEAKMAN AND COMPANY LIMITED, LEIGH, LANCASHIRE

Telephone: Leigh 94.
London Office: Godliman House, Godliman Street, London, E.C.4
Telephone: City 2810

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Plasticising substances for resins.—Compagnie Française de Raffinage. May 31 1945. 632,922.

Stabilisation of polythionic acid and polythionate solutions.—Norsk Sulfo A/S. Jan. 2 1941. 632,927.

Process for the preparation of a product suitable for use as a lubricant, an addition to a lubricant, or capable of being used in the preparation of a lubricant or an addition to a lubricant.—N.V. De Bataafsche Petroleum Maatschappij, and M. Van Loon. April 12 1946. 632,990.

Manufacture of cold-swelling starch products and of solutions of such products.—N.V. W. A. Scholten's Chemische Fabrieken. June 18 1945. 632,785.

Process for producing water-insoluble layers on substrata and the manufacture of preparations suitable therefor.—N.V. W. A. Scholten's Chemische Fabrieken. Aug. 18 1944. 632,786.

Pesticidal compositions.—B. F. Goodrich Co. July 31 1945. 632,848.

Preparation of compounds derived from polynuclear organic acids and phenols.—Ward, Blenkinsop & Co., Ltd., and G. J. Pritchard. July 27 1946. 632,710.

Manufacture and use of resinous anion-exchanger products.—Soc. l'Auxiliaire des Chemins de Fer et de l'Industrie. July 27 1946. 632,936.

Method of making a film of thermoplastic material.—B. F. Goodrich Co. Dec. 3 1943. 632,995.

Process for the production of a derivative of benzotetronic acid.—Spojene Farmaceuticke Zavody, Narodni Podnik. Nov. 6 1945. 632,801.

Production of interpolyamides.—J. G. N. Drewitt, and G. F. Harding. Dec. 16 1946. 632,997.

Manufacture of diazo-dyestuffs of the pyrazolone series.—J. R. Geigy A.G. Dec. 27 1945. 632,944.

Heat-resisting alloys and articles made from them.—Mond Nickel Co., Ltd. Jan. 17 1947. 632,712.

Acrylonitrile and the production thereof.—American Cyanamid Co. March 19 1946. 633,001.

Polysiloxanes.—British Thomson-Houston Co., Ltd. March 21 1946. 632,954.

Starch conversion process.—H. R. Blattmann, A. H. Blattmann, and M. H. Tesdorpf, [trading as Blattmann & Co.]. March 31 1947. 633,003.

Synthesis of hydrocarbons and catalysts therefor.—J. C. Arnold. (Standard Oil Development Co.). April 18 1947. 632,961.

Process for the treatment of complex lithium compounds.—G. & W. H. Corson, Inc. April 30 1946. 633,008.

Production of organic compounds by chemical transformations of methane or its sulphonated and/or oxygenated derivatives.—Houdry Process Corporation. May 31 1946. 632,820.

Process for the production of substituted thiophanes.—Haco-Ges. A.G. May 8 1946. 632,821.

Production of organohalosilanes.—Dow Corning Corporation. June 6 1946. 632,824.

Synthetic rubber-resin compositions.—United States Rubber Co. Oct. 19 1946. 632,722.

Manufacture of pyrazolones substituted in the 3-position.—Ciba, Ltd. July 30 1946. 632,832.

Processes for pelleting carbon black.—Columbian Carbon Co. Aug. 31 1946. 633,019.

Ammonium nitrate compositions.—I.C.I., Ltd., and J. Whetstone. Sept. 1 1947. 632,754.

Plastic compositions.—I.C.I., Ltd., and H. G. Reid. Sept. 8 1947. 632,757.

Process for the manufacture of 4-aminobenzimidazole.—Roche Products, Ltd. (F. Hoffmann-La Roche & Co. A.G.) Sept. 23 1947. 632,764.

Preparation of compounds derived from polynuclear organic acids and phenols.—Ward, Blenkinsop & Co., Ltd., and G. J. Pritchard. July 27 1946. 632,773.

Partial oxidation of hydrocarbons in the vapour phase.—M. W. Kellogg Co. April 23 1942. 633,334.

Bituminous material.—E. P. Newton. (International Bitumen Emulsions Corporation). Aug. 8 1945. 633,335.

Fluid composition for cleaning the surfaces of metals and other relatively hard materials.—G. W. Gregg. Oct. 4 1945. 633,059.

Process for the oxidation of vaporisable organic materials.—C. Arnold. (Standard Oil Development Co.). March 19 1946. 633,128.

Liberation of atomic energy.—Centre National de la Recherche Scientifique. May 1 1940. 633,339.

Manufacture of dry starch preparations soluble in cold water.—N.V. W. A. Scholten's Chemische Fabriken. Nov. 23 1944. 633,342.

Process of purifying glycerine containing ionisable impurities.—American Cyanamid Co. Sept. 15 1945. 633,343.

Processes in which an alpha, beta-unsaturated ketone is caused to act upon another material under conditions such that inversion of the alpha, beta-unsaturated ketone is a competing reaction.—Koppers Co., Inc. June 4 1946. 633,353.

Vat dyestuffs of the anthraquinone acridone series.—General Aniline & Film Corporation. Sept. 20 1945. 633,132.

Stabilising fats, fatty acids and fatty acid esters.—Severoceske Tukove Zavody (Drive Jiri Schicht), Narodni Podnik. July 17 1944. 633,084.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 *and* 50 *inclusive, or a woman between the ages of* 18 *and* 40 *inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.*

THE **CIVIL SERVICE COMMISSIONERS** give notice of a competition under Normal Regulations for pensionable appointment to the **ASSISTANT (SCIENTIFIC) CLASS (BASIC GRADE).**

Candidates must be at least 17½ and under 26 years of age on 1st January, 1950, with extension for regular service in H.M. Forces, but other candidates over 26 with specialised experience may be admitted.

All candidates must produce evidence of having reached a prescribed standard of education, particularly in a science subject and of thorough experience in the duties of the class gained by service in a Government Department or other civilian scientific establishment or in technical branches of the Forces, covering a minimum of two years in one of the following groups of scientific subjects:—

(i) Engineering and physical sciences.
(ii) Chemistry, Bio-chemistry, and metallurgy.
(iii) Biological sciences.
(iv) General (including geology, meteorology, general work ranging over two or more groups (i) to (iii) and highly skilled work in laboratory crafts such as glass-blowing).

Salary according to age up to 25—Men £195 (at 18) to £300 (at 25)—£380; Women, £195 (at 18) to £270 (at 25)—£320. A little less outside London. Opportunities for promotion.

Further particulars and application forms from the Secretary, Civil Service Commission, Scientific Branch,, 7th Floor, Trinidad House, Old Burlington Street, London W.1. Completed application forms must be returned by 31st March, 1950 (for candidates in the United Kingdom) or 10th May, 1950 (for candidates overseas). 5246/150.

SITUATIONS VACANT

ASSISTANT ENGINEER required for work in the Services Department of a large chemical and metallurgical works near London. Must be able to deal efficiently with problems on fluid distribution, process heating, and have some knowledge of chemical engineering. Age 23-25. Box No. C.A. 2887, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

THE MINISTRY OF SUPPLY invites applications for the following appointments in the Division of Atomic Energy (Production) at Springfields Factory, Nr. Preston, Lancs., and Windscale Works, Sellafield, Cumberland.

PLANT CHEMISTS to undertake supervisory duties in connection with the operation of a large chemical plant. Applicants should either have an Honours Degree in Chemistry or Chemical Engineering; Associateship of the Royal Institute of Chemistry, together with at least three years industrial experience, or Corporate Membership of the Institution of Chemical Engineers.

Salary for the above posts will be assessed (if under 30) according to age and qualifications on the scale £330–£570 p.a. and (if over 30) according to experience and qualifications, within the range £570–£720 p.a.

Candidates will normally be confined to natural born British subjects born within the United Kingdom or one of the self-governing dominions, of parents similarly born. Applications should be addressed to Admin. Branch D. At. En. (p), Risley, Nr. Warrington, Lancs. Ri. 8064-20.
16.12.49. IG.

THE **CIVIL SERVICE COMMISSIONERS** announce an Open Competition to be held in 1950 for recruitment under Normal Regulations of approximately 12 pensionable appointments as **ASSISTANT FUEL ENGINEER** (male) under the Ministry of Fuel and Power. Appointments will be filled by competitive interview.

Candidates must be at least 25 and under 35 years of age on 1st March, 1950, with extension for regular service in H.M. Forces, and, up to two years, for other service in H.M. Forces or for compulsory national service under the National Service Acts.

Every candidate must satisfy one of the following requirements: (a) Have obtained Corporate Membership of the Institution of Mechanical Engineers or the Institute of Fuel by examination, or (b) have a University Degree, or other examination passes required by the Institution of Mechanical Engineers or Institute of Fuel for exemption from sections A and B of their respective examinations for Associate membership, (c) Have obtained Corporate Membership of the Institution of Chemical Engineers, or (d) have Graduate Membership of the Institution of Chemical Engineers. Candidates must also have industrial experience in the use of Fuel and Power and practical knowledge in one or more of the following subjects: (1) The transmission and use of steam for power, and process or heating purposes; (2) the combustion and properties of British coals and other fuels; (3) producer gas practice and its application to metallurgical furnaces; (4) the design and operation of boilers, furnaces and ancillary equipment; (5) heating and ventilation practice and the domestic uses of fuel. Candidates qualified under (b) or (d) above will be appointed subject to their obtaining Corporate Membership of their respective Institutions before completion of the probationary period.

Inclusive London salary scale, £475 × £25—£750. Starting pay is linked to age 25 with addition of one increment for each complete year of age above 25 subject to a maximum/of £600. Rates rather less in the provinces.

Further particulars and application forms from the Secretary, Civil Service Commission, Scientific Branch, 7th Floor, Trinidad House, Old Burlington Street, London, W.1, quoting No. 2890. Completed application forms must be returned by 26th January, 1950. 5172/200.

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Volume LXII 14 January 1950 Number 1592

Devaluation's Other Face

A CURRENT issue of a U.S. chemical journal* has analysed the effects of European devaluation upon American chemical industry. The occasion calls to mind Burns's time-honoured lines, for we are enabled to see ourselves and our opportunities as competitors see them. The companion couplet: "It wad frae mony a blunder free us, and foolish notion," may be even more appropriate. The fundamental fact, which this article certainly does not disprove, is that the American manufacturer is a determined, unconditional competitor, and a very efficient one. If U.S. aid to dollar-deficient countries directly invites the export of American goods, he is going to fight tooth and nail to get his share of the business. If U.S. policy or inequality of currencies invites the landing in America of goods from dollar-seeking countries, he will fight with even more zest to prevent damage to his home business.

Since the £ and many other currencies were devalued the American chemical manufacturer has been worried. If he is offering something that is produced only in the U.S.A. his problem is much less pressing—merely the reverse effect of devaluation in the form of diminished exports. If he is offering something that Europe also produces, such as alkalis or penicillin, then so far as exporting in the world market is concerned the American manufacturer "might just as well have stayed in bed." During the latter months of 1949 the full effects had not been felt. U.S. exporters were still working on old orders, but a marked thinning of new orders was being experienced. Chemical plant manufacturers shared that experience, but for them the competitive effects of devaluation were reduced by American ability to offer earlier delivery dates and by the advantages conferred by advanced American technology. The American producer is not afraid of devalued prices if he can compete with time.

The troubles of producers in the dollar areas vary according to the commodity. In some cases, such as British creosote, it was not expected that cheaper imports (into the U.S.) would follow devaluation; instead, the price would be raised to afford a bigger profit in terms of the £. All commodities which

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* Chem. Ind., 1949. 65, 705–6

On Other Pages

Leader:
Devaluation's Other Face . . 37
Notes and Comments:
Payment by Results . . 39
New Insecticide . . 39
Poison Risk . . 39
Founding a Steel Industry . . 40
Re-designed Furnace for Carbon Black . . 40
Atomic Patents Released . . 41
£6.5 m. for Shell Research . . 41
World Congress . . 41
£2.5 m. for Salt and Chemicals . . 41
Synthetic Oil Additives . . 42
Pharmaceutical Exports . . 42
Competition with U.S. Chemicals . . 42
Continuous Soap Making . . 43
Fuller Use of Non-Ferrous Metals 44
ANNUAL REVIEW
Some News Events of 1949 . . 45
Progress in Polymer Production . . 59
Modifying Synthetic Resins . . 63
Applications of Atomic Energy . . 64
Fuel Industries in 1949 . . 70
Gas Engineering Problems . . 72
The Soap and Oil Industries . . 75
Powder Metallurgy Progress . . 79
Electroplating and Electropolishing 83
Legislation and Chemical Industry 89
German Industry in 1949 . . 91
Analysis of Coal Ash . . 94
Training in Manchester . . 94
An Introduction to Colorimetry . . 95
Geological Survey of N. Rhodesia 97
Trade in Swiss Chemicals . . 98
S. African Enterprise . . 98
Indian Chemical Research . . 99
India to Refine More Copper . . 99

were competitively priced before devaluation were expected to follow that course. Similarly, imports not wholly replaced by synthetics in America—rubber, waxes, and botanical chemicals, such as pyrethrum—were unlikely to be greatly affected. But certain chemicals were non-competitive before sterling was devalued and here the currency is being seen as " a wedge to open American doors." Chemicals instanced in the American journal were pyridine, cresylic acid, and naphthalene. Large users were still working on former contracts so that the full effect of devaluation was unlikely to be apparent for a time. Also, it is observed, " Many items carry such heavy tariff levies that devaluation will be ineffective. This is generally true of many fine chemicals such as dyes and pharmaceuticals."

In the longer-term prospect, this American report took considerable comfort from the history of previous currency devaluations. They had always been followed by inflation and temporary advantages were soon cancelled by resulting increases in prices and wages. Even so, the customary pattern of immediate but short-lived benefit to the devaluing country, though probable, is not thought in America to be a certainty. Even as a temporary palliative, devaluation could give time for invalid economies to recover competitive strength, for the establishment of good relationships with new buyers, and the creation of new trade patterns. The conclusion reached was that the adverse effect upon American chemical exports would not be long lived, but the effect upon American imports of European chemicals would be more enduring.

The most lasting effect was considered to be a tendency for increased investment of American dollars in foreign industries. An international company is protected against the effects of currency conjuring. South America had been buying certain drugs from the U.S. After de-valuation the order was transferred to the English associate of the same company. While this was an argument for dollar investments outside the United States, the threat of nationalisation and restrictions upon converting profits into dollars were serious counter-balancing factors.

On the whole, these American reflections on devaluation are more encouraging for us than for the American chemical industry. They are certainly not without useful pointers which can help us make the best of what is, after all, a bad job.

Notes and Comments

Payment by Results

THE provision of "incentives" seems destined to be one of those subjects—in this instance a controversial one—which are always treated in the abstract. The chairman of Imperial Chemical Industries helped to bring the subject to earth when he announced in Birmingham that the chemical group had gone some distance in applying the principle of higher payment for better work and recommended the principle to others. That was in November last, and the story has now been developed a stage further, in evidence of which is a special article in the *Newcastle Journal* last week, dealing with piece rates and work study at I.C.I., Billingham. There, according to the observer in the North-East, the will to work is strong—and is still growing. Nearly 2000 at Billingham are now recorded to have accepted the performance standards determined by the works study department. The traditional fear of unemployment is admitted to have cast a few doubts on the merits of the plan, but the sceptics themselves are becoming convinced "that it is not a trick to get them the sack." Representatives of 14 trade unions are reported to have put their signatures to a plan designed to secure maximum efficiency in all manufacturing processes and plant maintenance, and to put man-power and materials to the most economical use. Some nationalised industries and nationalisers, would do well to take this lesson to heart.

The New Insecticide

THE first full tests of the latest formulation to be used against aphis, the most destructive vector of virus diseases, and some others equally objectionable, seem to leave little doubt that several of the conspicuous disadvantages of other potent insecticides have been overcome. Among the well founded criticisms of DDT arsenic formulations and the rest has been the undiscriminating effects, which, destroying the beneficial predators as well as the aphis or red spider, have been accused of the capacity to do more harm than good. Bisol 3, Pest Control's name for bis (bis dimethylamino phosphonous) anhydride ($C_8H_{24}O_3N_4P_2$), is stated to be systemic and selective, so that it remains within the structure of the plant as a comparatively persistent insect poison which, however, does not destroy creatures such as ladybirds. Such wholesale destruction has in the past produced some very disconcerting results in the form of greatly increased populations of resistant strains of the insects it was intended to destroy. The value of the synthesis carried out by these chemists, led by Dr. G. S. Hartley, in collaboration with nine biologists and two medical research workers, appears to have been proved by extensive field trials, here and in the U.S.A.

Poison Risk

AN unfortunate property of all the newer chemical means of attacking insect pests is the possibility of toxic effects, which in some circumstances may be fatal, upon those who spray them or who eat the crop, when the elementary safeguards have been disregarded. The reality of that danger has been proved by some alarming occurrences following the use in the U.S.A. of some of their own products. Synthetic insecticides are accordingly being regarded in the U.S.A. with rather more suspicion than their real defects warrant. The fact that Pestox 3 is to be marketed in the U.S.A. by the Dow Chemical Company would seem to imply a greater confidence than is enjoyed by some American products. It is clear, however, that any highly effective new insecticide, including this organic phosphorus compound, demands for its safe use a system of stringent precautions not easy to enforce in agricultural and horticultural work. One of the indispensable precautions in the use of Pestox 3, for example, is that no crop should be treated within six weeks of harvesting. After six weeks the phosphorus compound breaks down into non-toxic phosphoric acid and dimethylamine. The danger of prolonged exposure during spraying is real enough, however, and the originators of Pestox 3 have been at pains to emphasise the need for full protection.

Founding a Steel Industry

NOW that making steel is in danger of becoming an object of State enterprise—if any—it is apt to recall one of many stalwarts to whom English steel and a great many other dependent materials owe their existence today. William Edgar Allen became a steelmaker for the excellent reason that he was dissatisfied with the tool steel he was buying for his own small business in Sheffield and was confident he could do better. How Allen, with a little capital, bought in 1867 the small steel works of Hoole Staniforth & Co., and began making steel and files himself has now been recalled in "The Edgar Allen News." Taking advantage of the rapid development of the railways in Southern Europe, William Allen quickly secured a good connection there which helped to promote industrial development and to increase the demand for steel. His reputation for honesty and attention to his customers' interests was soon known throughout the Continent. At home, too, Edgar Allen & Company was growing so rapidly that it soon required a private company and, in 1900, a public limited company, at Tinsley, to administer its expanding affairs. The Imperial Steel Works developed soon afterwards the Tropenas process of converting steel and became the pioneer of steel castings for electrical plant. The growing process has been more or less continuous ever since and the company is today operating one of Britain's largest steel foundries. Edgar Allen, before he died in 1915, was not content merely to produce good steel. The city of Sheffield preserves some of his other good work, including a library at the University and an institute for the treatment of rheumatic and other disorders.

Re-designed Furnace for Carbon Black Process

ONE of the firms closely identified with the introduction in this country of carbon black production on a large scale from petroleum sources is the applicant for an English patent (631,736) for an improved process and apparatus for black production. The invention, in the name of Phillips Petroleum Company, relates principally to a redesigned furnace associated with the methods described in the patent application 22,219/45.

In the production of carbon black by the so-called furnace method some processes are dependent on partial combustion of charge stock for the heat required; in others the heat is provided from a separate source—within the furnace or in a separate pre-heating furnace, or both.

In the present invention the furnace comprises a cylindrical chamber, closed at one end, and having a partial combustion zone; a central pre-heating tube extending through this zone and burner for injecting combustible gases into the pre-heating zone tangentially to walls of chamber. Within the tube is a cylindrical body to form an annular space between it and the tube walls, and this space may be of irregular diameter. An additional tangential burner may be included in the combustion zone.

A gaseous hydrocarbon charge is introduced axially into the cylindrical furnace chamber and part of this charge is converted into carbon black by heating and the injection of combustible gases (containing oxygen) tangentially to the inner wall. The velocity is sufficient to tend to dispose gases by centrifugal force against the inner surface of the wall adjacent to which the gases are burned. The incoming charge is directed through an annular space in a gas-tight conducting tube extending through the greater part of chamber, so that the charge is rapidly pre-heated and discharged axially in relation to the rest of furnace chamber. The yield of black is said to be substantially increased. The charge is preheated to 1800-2000° F., at which there is a content of 8-10 per cent olefins.

ATOMIC PATENTS RELEASED

67 Processes Disclosed in the U.S.A.

INAUGURATING a new programme to make non-secret technological information available for use by industry, the U.S. Atomic Energy Commission has released 67 of its patents to the U.S. Patent Office as patents available for sale. The commission will grant royalty-free licences and has authorised the Patent Office to prepare abstracts of the patents.

Among the 67 inventions first listed are patents covering mass spectrometer system; torsion balance, apparatus for storage of fluorine, welding or cutting metal by hydrogen-fluorine flame, production of fluorine, purification processes, ionisation, neutron meter, azeotropic distillation, preparation of uranium hydride and uranium monocarbide, producing calcium hydrides by distillation, alkali metal compounds, radiation measuring devices, chlorinated hydrocarbon, method and apparatus for control of beam energy, and nitrogen purification process. They cover a three-year period, October 29, 1946, to November 8, 1949.

£6.5 m. for Shell Research

AN allocation of £6.5 million for research in 1950 has been made by the Royal Dutch Shell group of companies, Shell is credited with having, in the U.K., the U.S.A. and Holland, some of the most modern and best equipped laboratories in the world, in which 3500 research workers are engaged in discovering new uses for the oil products and chemicals derived from crude oil, or seeking to improve their performance.

An important branch of this work is chemical research, which has made available a number of chemicals from petroleum. Already, plants are producing a considerable range of chemicals (solvents, plastics, detergents in particular) at Stanlow (Cheshire) at Pernis (Holland) and at a number of centres in the U.S.A.

Chadwick Public Lectures

River pollution and the River Boards Act, 1948, will be the subject of a lecture by Mr. Charles E. Scholefield to be given at the London Missionary Society, 42 Broadway, Westminster, London, S.W.1, on Tuesday, April 4 at 2.30 p.m. This is one of the 38th annual series of Chadwick public lectures being given between February and June.

WORLD CONGRESS

Analytical Chemists in London

THE plans for the holding of an International Congress on Analytical Chemistry in Britain in 1952 have been carried a stage further since the intention was announced in August last.

An approach has been made to the council of the International Union of Pure and Applied Chemistry for its patronage, to which the International Union agreed at its meeting in Amsterdam in September. The International Union noted that the proposals were in accord with one of the major decisions taken at that meeting, viz., the formation of six autonomous sections, one of which would be concerned with analytical chemistry.

It is likely that a meeting of the board of this provisionally constituted section on analytical chemistry could be arranged to coincide with the Analytical Congress in Britain.

Preliminary Discussions

The executive committee, under the chairmanship of the president of the Society of Public Analysts and Other Analytical Chemists, Mr. G. Taylor, has had preliminary discussions regarding location of the congress, publication of the papers, etc., and a sub-committee is studying the scope of the subjects to be discussed.

Sir Wallace Akers, C.B.E., is to be chairman of the finance committee and the general committee has the benefit of the advice and help of the president of the Royal Society, Sir Robert Robinson, O.M., who continues to act as chairman of the general committee.

The honorary secretary of the congress is Mr. R. C. Chirnside, Research Laboratories of the General Electric Co., Ltd., Wembley.

£2.5 m. for Salt and Chemicals

THE Murgatroyd Vacuum Salt Co., Ltd., which operates a substantial undertaking at Middlewich, is the principal of a new £2.5 million salt and chemical works being built at Tetton, near Sandbach, Cheshire, on a 40-acre site. It is expected to be in full production by next summer. The Congleton Rural Council and the urban councils of Sandbach and Middlewich have been asked to build houses for 200 workers and executives. The factory, which has the financial backing of the Treasury, is intended to play an important part in the export drive.

SYNTHETIC OIL ADDITIVES

Complex Modern Compounds

INCREASING importance is now being attached to the use of chemical additives in lubricating oils in order to improve their efficiency. Generally speaking these additives set out to procure these properties:—

Improve the oiliness of both mineral and vegetable oils; increase their film strength (this is most important as the use of smaller gears and greater power in modern cars has increased the gear tooth pressure to a point where in many cases pure petroleum lubricants are no longer able to protect the metal surfaces adequately); increase the resistance of oils to oxidation; inhibit the oxidation of bearings and other metal surfaces; increase the detergent dispersant properties of oils; improve the viscosity index.

Seldom does one additive alone meet all these requirements and manufacturers make use of a range of compounds, each being able to contribute certain characteristics to the oil, *e.g.*, to improve film strength use is now being made of tetramethyl or tetraethylthiuram disulphide; 1 per cent of one of these can increase the film strength of lubricating oils several times.

Special Properties

Some additives which claim to improve oiliness are essentially phosphite esters of alkylated phenols, one of which now on the market has a specific gravity of 1.04 at a stable 60°F. and on analysis gives 5.7 per cent phosphorus; 0.22 per cent of nitrogen and 0.5 per cent chlorine.

The additives, which are required to operate mainly as detergents in crankcase lubricating oils, are extremely complex metallo-organic compounds of the sulphurised alkyl phenol type containing about 4 per cent barium and 0.9 per cent sulphur. The presence of barium is considered to be most desirable.

Pure hydrocarbons of high viscosity are usually recommended for improving the viscosity index of oils; metallic naphthenates have also been used.

The general requirements of oil additives may be summarised thus:—

Solubility in lubricating oils throughout a wide temperature range; high stability throughout operating temperatures; high flash point, preferably about 400°F.; light colour; low viscosity unless used to increase viscosity; devoid of any objectionable odour; non-dermatitic.

PHARMACEUTICAL EXPORTS

Group Officers Appointed

THE following are the principal officers of the council and executives of the Association of British Pharmaceutical Industry required by the reorganisation of the association following the merger with the Pharmaceutical Export Group: President, Mr. R. L. Taylor (Johnsons of Hendon, Ltd.); vice-president, Mr. J. C. Hanbury (Allen & Hanburys, Ltd.); immediate past chairman, Mr. C. A. O. Rideal (May & Baker, Ltd.); hon. treasurer, Mr. H. C. H. Graves (Vitamins, Ltd.); trustees, Mr. H. J. Baker (Duncan Flockhart & Co., Ltd.), Mr. J. Stuart Hills (John Bell Hills & Lucas, Ltd.), Mr. J. W. Wigglesworth (Wigglesworth, Ltd.).

A council of 25 members was appointed, a home executive, under the chairmanship of Mr. C. Mervyn Hill (British Drug Houses, Ltd.), and an export executive of 14 under the chairmanship of Mr. G. W. Miller (Burroughs & Wellcome & Co.).

Competition with U.S. Chemicals

AMERICAN security may be jeopardised by over-generous aid to Western Germany and other countries receiving Marshall Aid, according to George W. Merck, president of the Manufacturing Chemists' Association, Washington. In a survey of the chemical industry in 1949, published in *Chemical and Engineering News*, Mr. Merck gives warning that foreign competition is becoming a major threat to continued chemical progress in the United States and that too extreme a policy of co-operation with war-impoverished nations may prove a costly boomerang, reducing American chemical output and creating wide employment. Many countries contemplated using Marshall Aid dollars for further expansion of their output of chemicals, dyestuffs, fertilisers, and plastics.

Purchase Tax and Exemptions

A revised list of drugs, medicines and simple chemical compounds subject to purchase tax and non-proprietary unbranded, preparations of official substances which are exempt from tax has been issued by the Commissioners of Customs and Excise as Notice No. 78B, January, 1950 (Drugs and Medicines). This supersedes notices Nos. 78B (October, 1946); 78M (April, 1948); and 78N (January, 1949).

CONTINUOUS SOAP MAKING

*Current Attempts to Avoid Batch Processing**

by A. H. CHARLTON

CONVENTIONAL soap-making is essentially a batch process. For many years, the technicians in the industry have endeavoured to work out a process which will make soap continuously, and over the past 75 years many patents have been taken out with this end in view.

Mostly the claims made for the continuous process relate to saving in costs from fuel, labour, floor space, etc., but few of them make specific claims that the quality of the soap so produced is equal to or even better than that produced by the time-honoured method.

To make soap by the continuous process it is necessary in the first place to devise a means for the correct amounts of fats and caustic soda to meet at a given point at which they are for all intents and purposes instantaneously turned into soap. This part of the process can be achieved with relative ease, but it has to be remembered that we have only produced at this point a mixture which contains soap and glycerine, and it is important that both for quality and economic reasons, the glycerine be removed from the mixture.

Spray Method

Among suggestions put forward to achieve this, one is that the mixture shall be sprayed through an atomised nozzle into heated air at such a temperature that the soap will lose its moisture and fall to the bottom of the spraying tower in the form of fine powder, while the glycerine and water will evaporate, the mixed vapours to be subsequently collected and condensed.

This, probably, is one of the least satisfactory processes, because the soap has not had the nigre separated from it and there is some doubt as to the overall efficiency of the glycerine recovery.

Another method is to remove first the glycerine from the fatty material by a splitting process in which the fats are split into fatty acids and glycerine. The glycerine is washed out by water from the fatty acids and the latter are then passed to a continuous soap-making plant. The product of this is sprayed into a heated tower through an atomising nozzle, the dried soap itself being collected at the bottom.

Here, again, the soap has not had its nigre removed, but is mainly suitable for use in making soap powders by mixing with alkali, preferably before spray drying. It is claimed that the pure dried soap can be hydraulically pressed into toilet soap tablets, but there is considerable variance of opinion as to whether toilet soap made by this method compares favourably with that made from soap manufactured by the boiled process.

Centrifugal Saponification

One of the latest methods of producing soap by the continuous process is the one in which the fats and oils are first blended and then accurately mixed in correct proportions with caustic soda solution and passed through a high-speed centrifugal machine. This is claimed to cause instantaneous saponification.

The soap from this centrifugal machine meets a current of brine which washes out the glycerine, the soap passing on to a second centrifugal machine which removes the excess of salt. The soap now meets a solution of caustic soda which ensures that all the fat is fully saponified and passes on to a third centrifugal machine, which removes most of the caustic soda. In a fourth similar machine a controlled amount of water is added to the mass. This is claimed to render the soap in the same condition in the boiled process as it would be after fitting in an ordinary copper.

In the boiled process, gravity separates the nigre and impurities from the soap. In the continuous process, the soap passes through centrifugal machines, in which, it is claimed, the mixture is separated into neat fitted soap and nigre.

The process outlined, would appear to be highly possible, but as far as can be seen at the moment, it ignores the desirability of allowing the soap to lose temperature from 212°F. to 170/150°F. This loss of temperature occurs in the boiled process during the period of rest after fitting, occupying two or more days. It is during this period that many physical alterations occur to the soap mass, which in the opinion of most soap-makers are essential, particularly for the production of a first-class toilet soap. It would seem, therefore, that this process is suitable for all purposes, except quality toilet soap.

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* Abstract of a paper, "Modern Methods of Soap Manufacture," presented recently before South Eastern Counties Section of the Royal Institute of Chemistry.

Fuller Use of Non-Ferrous Metals

November Stocks Reduced

CONSUMPTION of non-ferrous metals was higher in November than in the previous month and closing stocks at the end of the period, except those of tin metal, again showed a decrease.

November production of unwrought copper and unwrought zinc was lower than in October, but there was an increase in the output of main copper, alloy and products, lead and tin metal.

Details of production, consumption and stocks abstracted from the summary issued by the British Bureau of Non-Ferrous Metal Statistics included these:—

UNWROUGHT COPPER

	Long Tons Blister Copper	Long Tons Refined Copper
OPENING STOCKS:		
Govt. and consumers	52,568	91,299
Imports	7,001	12,781
PRODUCTION:		
Primary	—	9,348
Secondary	2,046*	6,149
CONSUMPTION:		
Primary	9,444	28,659
Secondary	—	14,989
Exports	2,891†	23
CLOSING STOCKS:		
Govt. and consumers'	50,570	86,036

* Rough Copper.

† Includes 1517 tons rough copper dispatched to Belgium and 1315 tons rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	25,852	long tons
Alloyed copper products	25,260	,, ,,
Copper sulphate	3,931	,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Long Tons Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	39,888	65,114
Imports	3,630	13,806
PRODUCTION:		
Virgin and remelted	—	4,800
CONSUMPTION:		
Virgin (incl. debased)	6,141	19,586
Remelted and scrap ...	—	7,995*
Exports and Re-exports	—	10
CLOSING STOCKS:		
Govt. and consumers'	37,377	64,169

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons Lead in Concentrates	Long Tons Imported Virgin Lead	Long Tons English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	57,348	2,277	—
Other stocks ...	70	—	—	—
IMPORTS	—	9,632	—	80
PRODUCTION ...	202	—	2,435	—
CONSUMPTION ...	219	15,714	2,563	12,491
Exports	—	39	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	53,001	2,149	—
Other Stocks ...	53	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,765
IMPORTS	—
PRODUCTION	2,715
CONSUMPTION	1,878
EXPORTS AND RE-EXPORTS	483

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	439
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	368

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	46.90

Rapid Steel Analysis

SCIENTISTS of the research laboratory of the United States Steel Corporation have adapted the Geiger counter, used to detect uranium and other radioactive materials, to the development of a quick and accurate method of analysing steel samples.

After careful calibration, Geiger counter analysis is expected to be even faster than the direct-reading spectrograph, itself a comparatively recent development in metallurgical analysis. Used in conjunction with special spectrographic equipment in laboratory studies, the counter has achieved a measure of success in quickly revealing the kind and quantity of alloying elements in steel. It measures the distinctive fluorescent rays that emanate from a steel sample of which the atoms have been ionised by X-ray.

In the research laboratory at Kearny, New Jersey, the instrument is connected to a self-balancing potentiometer, which plots the proportions of the elements.

This new and fast method of steel analysis promises marked advantages in the laboratory, and a still more important usefulness, when fully articulated, to assist the operator of a steel-making furnace to know quickly, at various steps of his furnace's heating cycle, whether he is getting the exact steel composition required.

Some News Events of 1949

Chemical industries are entitled to look back on 1949 as the year in which more progress was made towards the re-establishment of normal conditions, relatively more favourable than those of its predecessors to the formation of firm policies for peacetime production. The absence of acute fuel shortage, rather more stable supply conditions and the removal of a number of Government controls were important factors helping to offset the element of uncertainty which had discouraged the formulation of long-term plans. The readiness of industries to take full advantage of any approach to normal conditions was reflected in many schemes to widen the scope for research and for the development of new materials, to which this news summary bears witness.

JANUARY

THE possibility of deriving a wide range of chemical materials from a new source, the sisal plant (*agave sisalana*), was announced, following experimental work at Gerrards Cross (Bucks.) by the A.S.P. Chemical Co., Ltd.

The three organisations representing the manufacture of paint made a joint recommendation to their members to reduce prices in the home markets as from January 1, 1949.

I.C.I., Ltd. purchased the ammonia and hydrogenation sections of the chemical factory at Heysham (Lancs.), which it had operated as managers for the Government.

A pilot plant of the Minnesota Mining and Manufacturing Company, St. Paul, Minn., U.S.A., started the first commercial production in America of fluorocarbons.

Dr. D. G. Davey, who shared with the late Dr. Curd the leadership of the research which yielded Antrycide

Encouraging preliminary results with the new I.C.I formulation, Antrycide, a drug to protect cattle from the ravages of the disease spread by tsetse fly, was announced by the Colonial Office in conjunction with I.C.I., Ltd.

An important step towards extending the possibilities of protecting metal surfaces with rubber, was noted by the British Rubber Development Board. Dr. W. H. J. Vernon, of the DSIR Chemical Research Laboratory, Teddington, indicated some important water soluble rust inhibitors, of which sodium benzoate is the best known example.

Production of scientific instruments began at the Watling Street, Motherwell, factory which was taken over by Metropolitan-Vickers, Ltd., and Newton Victor, Ltd., a year before.

With the location by the Northern Chemicals Company, a subsidiary of the Lithium Corporation of America, of a large deposit of spodumene, the principal ore of lithium, 90 miles north-west of Winnipeg, a new industry was announced as being formed which may make Canada the world's leading producer of lithium.

The completion of 50 years' expanding activity was celebrated by Borax Consolidated, Ltd.

The development of a new insecticide, TEPP (tetraethyl pyrophosphate), for the control of aphids, mites and other plant pests, was announced by Albright & Wilson, Ltd.

A military security board, directly responsible to the three Commanders-in-Chief of the Western Zones, was established to prevent the revival of militarism and the creation of a war potential in Western Germany. The board was charged with ensuring that scientific research is not directed to warlike ends and that laboratories or factories are used only for peaceful purposes.

Further plant in Western Germany earmarked as reparations included that of Remynolwerke—a lead factory at Bendorf—and the Knoll alkaloid plant at Ludwigshafen.

Plant from the chemical factory at Anorgana, in Gendorf (Germany), was divided between France, Czechoslovakia, and Jugoslavia under the reparations scheme.

Work of dismantling was reported to be in progress at 195 plants in Germany, the total of completely dismantled plants to date being 235.

The experimental production in Britain, in 1950, of atomic power in a form suitable for industrial purposes, was envisaged by Sir Wallace Akers, a director of Imperial Chemical Industries, Ltd.

The conclusion in Warsaw of a five-year trade and finance agreement between Britain and Poland was announced.

The Liverpool Chemists' Association celebrated its centenary.

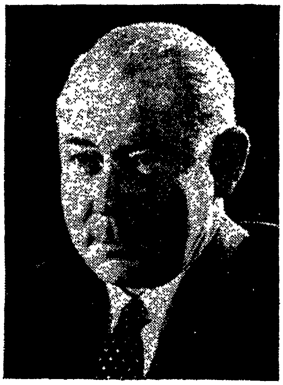
E. I. du Pont de Nemours and Co., Inc., (U.S.A.), announced its preparedness to licence competitors to use its Cellophane patents gratis to help meet the growing demand, and undertook to help prospective competitors by the loan of key technical personnel and in other ways.

Lye, being manufactured by A. Boake, Roberts & Co., Ltd., was introduced as an absorption agent for weak acid gases. It had been used successfully to replace the German pre-war supplies of Alkazid DIK and Alkazid M.

The introduction of a new analgesic Heptalgin (4-4 diphenyl 1-6 morpholinoheptan - 3 - one - hydrochloride) was announced by Glaxo Laboratories, Ltd., Greenford, in whose research establishment it was evolved and synthesised.

The value of chemical exports in December 1948 was announced as £7,347,063 compared with £5,916,489 in the corresponding month of the previous year. The total for the year 1948 (all chemical groups) was £83.6 million (1947 £67.4 million). Exports of the industry for the first month of 1949 reached a new high level with a total value of £8,212,770, compared with £6,756,587 in January 1948.

Personal: SIR THOMAS MERTON, SIR EDWARD SALISBURY, SIR JAMES CHADWICK and PROF. A. C. HARDY were appointed vice-presidents of the Royal Society for 1949. SIR JOHN RUSSELL became the 111th president of the British Association. MR. ELMER R. RAMSEY succeeded DR. J. VAN NOSTRAND DORR as president of Dorr Company of the U.S.A.



Mr. E. A. O'Neal, Junr.

MR. EDWARD A. O'NEAL, Junr., became chairman of Monsanto Chemicals, Ltd., of which he was managing director.

In the New Year Honours list the sciences and chemical industry were not singled out for distinctions. However, Sir John Boyd Orr, recently director-general of the UN Food and Agriculture Organisation, was created a baron; William G. Ogg, director of Rothamsted Experimental Station, and Henry Guy, chairman of the mechanical engineering research organisation of DSIR, became knights; the order of G.C.B. was conferred on Sir Henry Tizard, chairman of the defence research policy committee of the Ministry of Defence, and the C.B.E. on Colonel W. C. Devereux, managing director of Almin, Ltd., and chairman of International Alloys, Ltd.

Obituary: Mr. Geoffrey Fertel, Lord Melchett, Mr. Bernard W. Methley, Dr. John Percival, Mr. Herbert W. Rowell, Mr. Richard M. Stothert, Mr. Ernest M. Baker, Mr. Douglas J. Birdsall, Dr. R. L. Dodds.

FEBRUARY

A DEFENCES Services Research Facilities Committee was set up to "consider proposals for the use of Service facilities and personnel for assisting scientific research." The initiative came from the Royal Society.

Pilkington Brothers, Ltd., glassworkers, of St. Helen's, acquired a majority holding of the shares of James H. Jobling and Company, of Sunderland.

A further step in its already extensive programme for the encouragement of the study of textile technology and science was the Textile Institute's offer of a new open scholarship worth up to £1000.

The pioneering development in Manchester of supplementing the town gas supply by the use of residual gases from oil refining reached the productive stage when the Manchester Gas Department took 140,000 cu. ft. of rich oil gas by direct pipe-line from the new petroleum chemicals plant at Partington of Petrochemicals, Ltd.

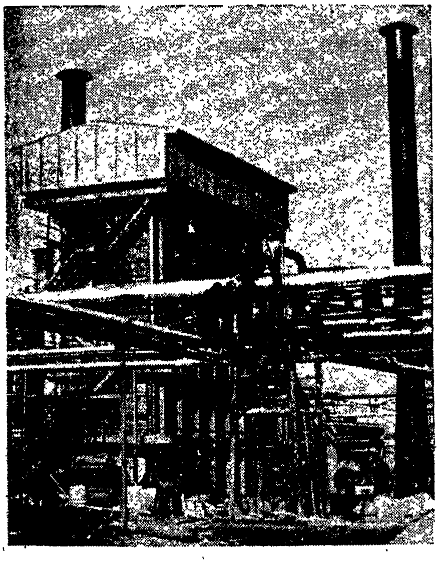
A Dublin and District Section of the Society of Chemical Industry was formed at a meeting in Trinity College, Dublin.

The British Dyewood Company, Ltd., Glasgow, celebrated its centenary.

Exhibited at the Textile Industry Exhibition, Manchester, was a new development in colour matching—a unit composed of two blue fluorescent and two ordinary lamps, the light of which is mixed and diffused through a Perspex screen.

The revocation was announced of all remaining orders controlling the production, distribution, acquisition and disposal of fertilisers.

A skin disease which swept through Central Baden, in the U.S. zone of Germany, was traced to phosphorus on the ignition strips of certain match boxes. Investigators found that when boxes were carried in trouser pockets vapour from the igniters caused inflammation, which became worse if exposed to other chemical elements.



The first furnace put into operation by Petrochemicals, Ltd., at Partington, Manchester, serving the new Catarole process to provide petroleum-based chemicals

Laboratory tests were reported as being carried out with a new antibiotic drug, diplomycin, discovered by Dr. Karl Noster, a German bacteriologist. Patients in several Hamburg hospitals were undergoing treatment with the drug for various diseases, including tuberculosis of the lungs.

A Home Office amendment of the Poison List and Rules, relating to the indication of character to be prescribed for the labelling of agricultural and horticultural insecticides and fungicides containing dinitrocresols and certain phosphorus compounds required warnings to ensure safe handling to be printed on packages.

A five-day conference of the International Scientific Committee for Trypanosomiasis was held at the Colonial Office, London. Scientists from Britain, France, Belgium, Portugal, South Africa and Southern Rhodesia attended, and means of promoting further research were discussed.

U.K. chemical exports in February were of substantially less value than those of January. The comparative figures were: January £8,212,770, February £6,737,432. They were, however, well in excess of February 1948 (£5,706,340).

Personal: The British Welding Research Association appointed MR. W. K. B. MARSHALL assistant director of research. SIR BEN LOCKSPEISER succeeded SIR EDWARD APPLETON as secretary of the Council for Scientific and Industrial Research. DR. JOHN F. THOMPSON was elected president of the International Nickel Company, Inc.

Obituary: Dr. Cyril Dustan, Prof. T. S. Patterson, Mr. Alfred Diggory, Mr. James MacGregor, Mr. Edward T. Sterne, Mr. L. V. Kenward, Dr. Moritz Niessner.

MARCH

BRITAIN'S large atomic pile at Harwell was used for the first time for the production of radioactive isotopes and the first deliveries from this source were announced to start early in March.

Regulations made by the Minister of National Insurance added beryllium poisoning to the list of industrial diseases scheduled under the National Insurance (Industrial Injuries) Act.

Further developments in the preparation

of moulded catalysts of exceptional stability, resistance and activity were claimed in two English patents by N.V. de Bataafsche Petroleum Maatschappij.

Part of the anniversary meetings of the Chemical Society, a symposium on the chemistry of the heavy elements (Oxford) was noteworthy for its international character, the speakers including authorities on nuclear fission products from the U.S.A., Canada, Germany, France and Austria and many from this country.

Implementing the decision to divide the undertaking of Brotherton & Company into an operating company and a private investment company with £1,475,000 capital, an offer was made to sell 600,000 ordinary 10s. shares in the former company at £1 each.

On charges that they had conspired to restrain and monopolise world trade in titanium pigments—which they denied—the National Lead Company, E. I. du Pont de Nemours and Co., Inc., and four other defendants were ordered to pay fines totalling $43,000 by the U.S. District Court in New York.

The first practical adaptation of radioactivity to the textile industry was made in Yorkshire and Lancashire mills, to record the absorption of radiation in its bearing on the thickness of cloth.

An improved method for the reduction of a carbon oxide, especially CO, with hydrogen, to form hydrocarbons, using the Fischer-Tropsch synthesis and a fluidised catalyst, was claimed by the Standard Oil Development Co. (U.S.A.) in an English patent application.

The Zinc Develoment Association announced the formation of the Hot Dip Galvanisers' Association, a non-trading body operating from the ZDA headquarters, which had been set up to promote the development of existing and new uses of hot dip galvanised coatings, and to improve galvanising technique.

The Coal Tar Research Association was registered on March 29 as a company limited by guarantee, without share capital, to take over the assets and liabilities of the unincorporated association of the same name.

A gift "not exceeding £15,000" was made by the Rockfeller Foundation to Cambridge University for the purchase in the U.S.A. of equipment to be used in the chemical laboratory under the direction of Prof. A. R. Todd, university professor of organic chemistry.

Furthering its programme of basic research on the properties of matter at extremely low temperature, where many remarkable phenomena occur, a new and usefully improved type of helium liquefier was announced as being in use at the U.S. National Bureau of Standards.

The quantitative determination of phenol and cresol in complex biochemical samples was facilitated through an application of the countercurrent distribution method, as a result of work carried on at Camp Frederick, Maryland, by U.S. Army investigators.

A new laboratory of Organon Laboratories, Ltd., at Newhouse, Lanarkshire, designed to manufacture synthetically vitamins and the whole range of hormones, was officially opened by the Secretary of State for Scotland, Mr. Arthur Woodburn.

The first school in Britain to be built of aluminium was opened at Bristol by Mr. George Tomlinson, Minister of Education.

An event possibly historic in its implications was recorded in the announcement by the Ministry of Supply that plutonium, the highly fissile element made in quantity only in the U.S.A., had been produced at the Atomic Energy Research Establishment, at Harwell.

To stimulate the discovery and exploitation of uranium deposits, particularly in Colonial territories, the Ministry of Supply offered to buy all ores and concentrates and, in certain circumstances, to assist mine development and primary processing by making capital payments. The

Preparing the crude natural rubber for subsequent treatment with hydrochloric acid gas, the new Goodyear Tyre & Rubber Company process for producing a versatile packing material—Pliofilm offer applied equally to the U.K., although chances of discovering uranium here were considered slight.

The official opening on March 16 of the reconstructed and much extended research laboratory of the General Chemical Division of Imperial Chemical Industries, Ltd., at Widnes, Lancashire, coincided with the completion of 58 years of chemical research there.

A further step in the closer integration of British petroleum refining with the general economic and industrial activity of the country was the opening of a pipeline from the Ellesmere Port (Cheshire) gas works to the nearby petroleum refinery of Lobitos Oilfields, Ltd.

Scientists associated with chemistry or the physico-chemical sciences comprised more than half the long list of Fellows of the Royal Society elected at its meeting on March 17.

The oil refineries at Haifa, which had been in Israeli hands since July 1948, were handed back to British management.

The Danish Finance Council allocated Kr.100,000 for a scientific expedition which was to investigate the deposits of lead recently discovered in Greenland.

Chemical exports in March (which was a longer working month) reached a value of £7,517,228, compared with £6,651,789 in the corresponding month of 1948.

Personal: SIR HENRY DALE resigned the chairmanship of the British Council's Science Advisory Committee. PROF. SOLLY ZUCKERMAN was appointed deputy chairman of the Advisory Council on Scientific Policy and the Committee on Industrial Productivity. Fine Chemicals Group of the Society of Chemical Industry appointed SIR JACK DRUMMOND as its chairman. SIR ROBERT ROBINSON, PRS., was elected honorary member of the Parliamentary and Scientific Committee. SIR ROBERT SINCLAIR was nominated president of the FBI. DR. R. P. LINSTEAD was appointed to succeed SIR IAN HEILBRON as professor of organic chemistry and director of the organic chemistry laboratories at the Imperial College of Science and Technology.

Obituary: Mr. Charles E. Hodgkin, Sir Thomas Hill Easterfield, Mr. John J. Murphy, Mr. Matthew Forrest, Mr. R. H. Parker, Mr. G. T. Rice, Mr. Charles H. Wilson, Prof. C. H. Lander.

APRIL

IT was announced that the experimental atomic power plant under construction near West Milton, New York, would use liquid metal as a heat transfer medium and produce steam to drive steam turbine generators. The reactor was stated to differ from most previous reactors in the

The largest chemical laboratary in Widnes was part of the newly opened research centre serving the General Chemical Division of I.C.I., Ltd. The comprehensiveness of the service provided is indicated by this workshop section, designed to supply most of the laboratory's needs for special instruments and semi-technical and pilot plants

Professor D. M. Newitt, elected president for 1949 *of the Institution of Chemical Engineers*

higher energy of the operative neutrons produced by the chain reaction of uranium.

Aluminium stated to be 99.996 per cent pure was reported as being produced at the Vigoland plant in Southern Norway.

An old open-hearth steel furnace near Scunthorpe, of Richard Thomas and Baldwins, Ltd., was demolished and a new all-basic one was constructed in 27 successive working days. This was believed to be a speed record.

The removal of the existing Board of Trade maximum price control of sulphuric acid—battery or accumulator acid, reagent acid and acid containing not more than 25 per cent free SO_3—and the substitution of a new schedule at a lower scale for all other strengths was announced.

Uranium and thorium ore were reported to have been found in Scaler's Hill Colliery, Rochester, Kent.

The difficulty of sustaining payment in dollars and hard currencies obliged the Indian Government temporarily to exclude imports of soda ash.

Tyre treads, claimed to be superior to any formerly manufactured, were reported as having been developed by chemists of Philips Petroleum Company through the use of "cold" rubber and a new type of high abrasion furnace black. The new chemical substance employed was named Diox.

The use of mineral oils as an ingredient in the manufacture of food for sale to the public was prohibited (Mineral Oil in Food Order, 1949).

C. A. Parsons and Co., Ltd., Heaton, Newcastle-on-Tyne, received a further contract for the building of the second steam turbine required for the Ontario Hydro-Electric Commission's new £10 million plant at Toronto, Canada.

Projects for the modernisation of steel manufacturing facilities in the U.K., Austria and France, and two aluminium foil projects in France, were the subjects of dollar allocations approved by the Economic Co-operation Administration, involving the equivalent of more than £7 million of ECA funds to be available before June 30, with a long-range total of nearly £12.5 million.

The financial and administrative control of the scientific activities of the Imperial Institute, South Kensington, were transferred, as from April 1, to the Colonial Office. Its Empire educational work was delegated to the Ministry of Education.

Sir John Simonsen, director of the British Colonial Products Research Council, was chosen as the first recipient of the American Fritzche Award instituted "to recognise and encourage outstanding achievement in analysis, research, and new applications of essential oils, essential oil isolates, and related chemicals."

An improved protective film (Avigel 100), applied cold by brushing or spraying to metals, glass, ceramics, plastics, and other substances was developed in the laboratories of Clear Glass Products, Ltd., Southampton.

The official opening of the new Honeywell-Brown, Ltd., plant at Blantyre, revealed the continued expansion of the scientific instrument industry in Scotland.

Mr. George Taylor, who was installed president for the year of the Society of Public Analysts

The development was expected to effect a considerable dollar saving and to develop the export trade in recording and regulating equipment.

Personal: MR. C. LORD was elected president of the Association of Tar Distillers. DR. W. HUME-ROTHERY was presented with the Institute of Metals medal for 1949 for work in the science of non-ferrous metallurgy. SIR CLIVE BAILLIEU was appointed chairman of the Dunlop Rubber Company. MR. A. G. GRANT became chairman of the BCPMA. The Meldola Medal for 1948 was awarded by the Society of Maccabaeans to DR. R. A. RAPHAEL. MR. LELAND I. DOAN became president of the Dow Chemical Co. (U.S.A.).

Sir Stafford Cripps, speaking in Edinburgh, announced the Government's intention to finance peat-fuel engine research with an initial sum of £50,000.

To mark the 75th anniversary of the production of soda ash at the Northwich factory of Brunner Mond—predecessor there of I.C.I., Ltd.—in May 1874, a party was given to employees, their families and friends, numbering some 23,000.

The board of the J. R. Geigy A.G., Basle, turned to the Swiss capital market for a 3½ per cent loan of Fr. 12 million. The loan was issued at 99.4 per cent.

The total value of chemical manufactures, excluding drugs and dyestuffs, exported in April (£3,614,873) was £245,266 less than the figure in April 1948.

Obituary: Dr. Friedrich K. R. Bergius, Dr. Williard H. Dow, Mr. Whiston A. Bristow, Mr. W. F. Bowden, Mr. John Irwin, Sir Wyndham Dunstan, Dr. Albert Mylius, Dr. Walter Gygax.

MAY

THE Food and Agricultural Organisation of UNO, implementing the recommendation of the International Emergency Food Committee, announced that the international allocations of nitrogen fertilisers would be discontinued from June 30, 1949.

An important advance in British technology was marked by the Ministry of Supply announcement that radium and radon, sources of highly penetrative gamma rays, could now be supplied for industrial radiography.

The Ministry of Food decided that, from May 22, soap-making licences would be granted to intending manufacturers who were in possession of the plant and facilities.

Colvilles, Ltd., decided to go ahead with one of the largest schemes of steel expansion ever promoted in Scottish metal industries, at a cost of £4.1 million, regardless of the prospect of nationalisation of the industry. The scheme involved extensions at the Clyde Ironworks and the Clydebridge Steel Works, on opposite sites of the River Clyde.

The Massachusetts Institute of Technology announced the granting of scientific and technical scholarships to six British students for the summer course in Cambridge, Mass. There were more than 35 candidates.

Among the many items of scientific interest at the BIF, atomic research, past and present, was represented by characteristic pieces of apparatus on the Ministry of Supply's AERE stand.

The appointment of chemists and physicists to the staff of the Scottish Woollen Technical College, announced by Mr. Arthur Woodburn, Secretary of State for Scotland, marked a further step in the long co-operation between the Scottish woollen industry and the Brtish Wool Industries Research Association, Leeds.

A considerable reduction in the time required for production of uniform neat soap and the like was described in an English patent application, open to public inspection, by Lever Bros., and Unilever, Ltd.

The United Nations International Children's Emergency Fund was reported to have signed a contract with I.C.I., Ltd., Manchester, for the supply of 50,000 vials each containing 3 million units of procaine penicillin, to be used for combating syphilis.

A new research centre of Monsanto Chemicals, Ltd., was opened at Ruabon.

Personal: DR. A. S. C. LAWRENCE was granted a Beilby Memorial award of 150 guineas for research work in colloid science. MR. KENNETH HALL was appointed president of the Council of the Aluminium Development Association. MR. R. L. TAYLOR was elected chairman of the Association of British Pharmaceutical Industry. PROF. J. T. RANDALL, DR. H. A. H. BOOT and PROF. J. SAYERS shared £36,000, presented by the Royal Commission on Awards for wartime research on radar.

Obituary: Sir Robert Robertson, Prof. F. S. Kipping, Mr. R. G. Perry, Mr. John W. Hawley, Mr. Douglas J. Davis, Viscount Leverhulme.

JUNE

THE adoption by Great Britain, the U.S.A. and Canada of the new "unified" screw thread was announced.

I.C.I., Ltd., received Dean of Guild approval to extend its Grangemouth dyestuffs factory at a cost of £131,000.

An extensive new seam of coal, nearly 6 ft. thick, supplementing the discoveries near Lichfield and Brereton, was located at a depth of 27,000 ft. during the sinking of a new shaft at Clipstone Colliery, Mansfield, Notts. The mineral wealth of the seam was described as almost limitless.

An official British announcement issued from Düsseldorf stated that dismantling was to begin on June 8 at the four Fischer-Tropsch synthetic oil and chemical works in Wanne-Eickel, Dortmund, Castrop-Rauxel, and Bergkamen. In all, six Fischer-Tropsch, three Bergius, and two artificial rubber plants were scheduled for dismantling under the terms of the Washington Agreement.

A project estimated to cost £37.5 million began at Fawley, Southampton, for the construction of the Anglo-American Oil Company's new oil refinery, which it was claimed would be the largest in Europe.

The increased importance of chlorine dioxide in recent years, in its capacity as an energetic oxidising agent, lent interest to two new methods of production which were the subject of English patents recently opened to public inspection.

A grant of $20,000 to the University of Saskatchewan for plant food research, using radioactive tracer techniques, was made by the Consolidated Mining and Smelting Co. of Canada, Ltd.

New laboratories were opened at the West Bank Works, Widnes, of W. J. Bush & Co., Ltd. The new building comprised both research and works departments.

An agreement between Compagnie Française de Raffinage and the Standard Française des Pétroles provided for technical and commercial co-operation between these two leading French oil refining companies.

A 12-man research institute was being set up by the Government of Israel to serve as the highest authority in the State for the co-ordination of research and the advancement of science.

A factory four miles north of Saldanha Bay, South Africa, designed to produce £500,000 worth of magnesium and other salts and metals from sea water annually, started production on June 1.

A discovery capable of doubling South Africa's available imported creosote supplies (from 250,000 to 500,000 gal. a year) was announced by the Forest Products Institute in Pretoria. The discovery was principally a "bridging agent" permitting the mixture of certain mineral fuel oils with creosote.

The laboratories of the Research Council of the British Whiting Federation were established at Bedford, for the study of the properties and uses of whiting and other forms of processed chalk.

The belief in Great Britain's continued eminence in scientific research was testified by the endowment and establishment of a new Ciba Foundation at 41 Portland Place, London, W.1.

The successful operation at their Hull works of new plant for large-scale production by the Bisol process of acetoacetanilide for the dyestuffs industry was reported by British Industrial Solvents, Ltd.

Chance Bros., Ltd., Smethwick, Birmingham, announced the production of a new ophthalmic glass, to replace a former type which has been banned for commercial purposes by the Government owing to the strategic value of uranium, a small proportion of which was used in its composition.

Personal: PROF. H. P. HIMSWORTH was appointed secretary of the Medical Research Council, from October 1. Order of Merit was conferred on SIR ROBERT ROBINSON. DR. C. F. FLINT was appointed head of the National College of Rubber Technology. MR. ALLAN DRAPER was elected chairman of the Textile Institute for next 12 months.

Obituary: Mr. J. P. MacKinnon, Dr. James D. Ogilvie, Mr. Sidney Abbey, Mr. Charles A. Buckmaster, Mr. John M'Gougan, Prof. Edmund J. Garwood, Mr. James A. Macarthur, Dr. Herbert W. Bolam, Mr. Robert E. Gale, Mr. Charles Day.

JULY

THE CHEMICAL AGE started its 61st volume and No. 1564 in a new guise with new type faces and bolder style headings.

Some details of Harwell's "hot" laboratory for separating fission products were revealed by the Ministry of Supply.

Need for some form of international regulation was urged by the International Tin Study Group at its meeting in London.

Fuller Colonial research was made possible by the new Colonial Development and Welfare Act (1949) under which the annual amounts payable were increased to £2½ million.

Names of the chairman (Sir Percy Mills) and members of the National Research Development Corporation and its powers to exploit inventions to the benefit of the community were announced.

Fourth Empire Mining and Metallurgical Congress was held in London, with technical sessions at Oxford and excursions round Cardiff, Cornwall, Edinburgh and Newcastle-on-Tyne.

The work of the Chemical Research Laboratory, Teddington, was shown to scientists and the Press, revealing useful advances in metal protection and insecticides.

Improved methods of isolating thorium were claimed in the U.S.A. at the second annual Analytical Symposium of the American Chemical Society.

Two new synthetic fibres, one derived from cottonseed protein, the other from chemically modified cellulose, were produced experimentally at a U.S. Bureau of Agriculture and Industrial Chemistry's research laboratory in New Orleans.

Laporte Chemicals, Ltd., in its 42nd annual report, showed a group profit of £583,336.

Numbers of persons employed in the chemical and allied trades totalled 435.1 thousand, a slight increase over the previous month.

[Shell Photographic Unit

The magnitude of the engineering task was revealed on the eve of the opening of the Shell petroleum chemicals plant at Stanlow, of which this distillation unit forms a part

The end of bulk purchase and return to conditions of a free market were advocated at the annual general meeting of the British Non-Ferrous Metals Federation.

Steel output for July reached an annual rate of 12.695 million tons compared with 12.084 million tons in the same month of 1948.

Improvement in the stock position of basic chemicals in July continued. Production figures generally reflected a small increase, but there was little change in the level of consumption.

An anti-trust suit was filed by the U.S. Attorney-General in Chicago on behalf of the Department of Justice in an attempt to break up the $1588 million organisation of E. I. du Pont de Nemours and Co., Inc., the largest chemical producers in the U.S.A.

Chemical manufacturers in the Anglo-U.S. zone of Germany demanded that German experts and trade associations should be allowed to participate in commercial negotiations with foreign countries.

Claims from Ceylon stated that novel methods had been evolved to use rubber for the production of wood preservatives, insecticides, varnishes, etc.

The first large-scale plant in Great Britain for the production of Alkathene film in continuous rolls up to 46 in. wide came into operation.

The project was announced to spend $10 million on developing newly discovered asbestos deposits near Larder Lake, North-West of Ontario, Canada.

Modern plant for production of pharmaceutical chemicals was opened at Verona, Italy, by Glaxo Laboratories, Ltd.

Methoxychlor, the methoxy analogue of DDT, reached the pilot plant scale stage of development in the U.S.A.

Conophor oil was produced at Liverpool University from the seed of a West African wild vine *tetracarpidium conorphorum* as a potential substitute for linseed oil.

Attempts to tap the first potash deposits in England were reviewed in a report issued by the Mineral Development Committee, which recommended development by the State of all such minerals.

Chemical exports from the United Kingdom in July totalled £6,434,589, compared with £6,947,307 in the previous month and £7,580,839 in July 1948.

Personal: Prof. E. C. Bullard, professor of physics, University of Toronto, was appointed director of the National Physical Laboratory, Teddington, in succession to Sir Charles Darwin.

The Croonian Lecture for 1949 at the Royal Society, London, was delivered by Dr. W. Bronk, foreign secretary of the National Academy of Sciences and chairman of the National Research Council of the U.S.A.

Prof. James W. McBain, professor of chemistry at the U.S. Stanford University, was appointed director of the National Chemical Laboratory, Poona.

Prof. O. V. S. Bulleid was elected president of the Institute of Welding for 1949/50.

Sir Graham Cunningham, chairman of Triplex Glass, Ltd., and Quickfit and Quartz, Ltd., was appointed first chairman of the Dollars Exports Board.

Dr. H. W. B. Skinner, former deputy chief scientific officer in charge of the general physics division at the AERE, Harwell, was appointed to the Lyon Jones chair of physics at Liverpool University.

Obituary: Prof. Otto Liebknecht, Mr. William D. Penly, Mr. Samuel Renton, Mr. Frank van Zwanenberg, Prof. Otto Czadek, Mr. Harry Collinson, Mr. Charles Brotherton.

AUGUST

PROPOSALS to manufacture carbon black at Avonmouth were described at the annual meeting of Philblack, Ltd. The plant was designed to produce 50 million lb. of carbon black a year by a U.S. process.

Further research developments on substitutes for linseed oil were described by the Colonial Products Research Council.

Increased standardisation as an aid to greater productivity was recommended by Lord McGowan, president, at the 48th annual general meeting of the British Standards Institution.

A project was announced to revive the sulphur mining industry in Sicily.

Israeli's first major optical lens grinding plant began operations in Haifa.

First International Congress of Biochemistry was held at Cambridge.

The number of deaths from industrial accidents in the U.K. in August was 187, a decrease of six from the previous month, but 29 more than in August, 1948.

Production and consumption levels of basic chemicals in the U.K. in August showed an increase over the same month of 1948. The price of lead rose to £87 5s. a ton.

Expansion schemes costing £40 million were disclosed by Lord McGowan, chairman of Imperial Chemical Industries, Ltd., on his visit to the Dyestuffs Division, Grangemouth, Stirlingshire.

The second stage in a development scheme for steel and ore grading plants involving a further £8 million expenditure was announced by Dorman Long & Co., Ltd.

Problems concerning the emission of toxic fumes or gases and pollution of the atmosphere were reviewed in the 85th Annual "Report on Alkali, etc., Works," for 1948.

A new liquid oxygen converter was reported to have been developed by the U.S. National Bureau of Standards.

Eleven of America's largest alkali producing companies, all members of the U.S. Alkali Export Association, were ruled to have violated the Sherman Anti-Trust Act by the decision of U.S. Federal Judge, Samuel I. Kaufman.

The first continuous shale-oil refinery in the U.S.A. was put on stream by the U.S. Bureau of Mines, near Rifle, Colorado.

Steel output for August reached an annual rate of 14.953 million tons, compared with 14.117 million tons in the same month of 1948.

Chemical exports for the month showed a general decrease compared with August 1948, the total value being £6,594,864, against £7,021,087.

Personal: Dr. F. J. Wilkins, of Glaxo Laboratories, Ltd., was appointed executive director at Ulverston and Barnard Castle. The Ministry of Supply appointed Mr. J. G. Ball, of the BWRA, to be principal scientific officer at the Atomic Energy Research Station, Harwell. Mr. H. M. Garner was appointed chief scientist of the Ministry of Supply.

At the newly founded New South Wales University of Technology: Dr. J. P. Baxter appointed to the chair of Chemical engineering; Dr. A. E. Alexander, to the chair of applied chemistry. Dr. H. N. Rydon was appointed reader in organic chemistry in the Imperial College of Science and Technology. Honorary degrees conferred at Cambridge on, among others, PROF. ARNE TISELIUS, at the first International Congress of Biochemistry. DR. I. M. RABINOWITCH, of Montreal Hospital, was awarded $10,000 by the Sugar Research Foundation, Inc., to continue his work on carbohydrate metabolism. DR. IRVING M. KLOTZ was awarded the $1000 Eli Lilly & Company prize for biological chemistry at a meeting in September of the American Chemical Society.

Obituary: Mr. W. H. French, Dr. Fritz J. Hansgirg, Mr. John Stewart Macarthur.

SEPTEMBER

THE adoption of a standardised screw thread was recommended by delegates of 15 nations at the meeting in Paris of the International Standardisation Organisation.

The British Association for the Advancement of Science held its 111th annual meeting at Newcastle-on-Tyne.

A further stage in the development by Imperial Chemical Industries, Ltd., of its £22 million project was marked by a visit of specialists and members of the Press to the big group of chemical installations at Wilton.

The widening range of industrial chemistry and engineering in the North was demonstrated at the Scottish Industries Exhibition, Glasgow.

The development of Canada's chemical industries and their prospects of greater Canadian oil production were discussed at the regional conference of the American Institute of Chemical Engineers, held in Montreal.

Sir John Simonsen, director of the Colonial Products Research Council of the Colonial Office, received the Fritzsche Award for research on essential oils at the 116th national meeting of the American Chemical Society.

Chrome pigments were exempted from export licensing.

Chemical processing plant of many kinds was prominent at the Engineering and Marine Exhibition, at Olympia, London.

The intention was announced to establish the first rubber factory in Ceylon. One-fifth of the Rs.5 million capital will be foreign, chiefly American.

Rapid progress was reported in the construction of the £37.5 million Esso refinery at Fawley, near Southampton.

New German patent legislation was agreed to by Anglo-American authorities.

The report on India's plastics industry showed great increase in production of finished goods and emphasised the need for a central factory to manufacture moulding powders.

Chemical exports for September were valued at £6,994,535 compared with £7,519,213 in the same month of the previous year. The first nine months of 1949 totalled £64,546,670, which represented an increase of £2,344,959 over the same period of 1948.

Personal: SIR HAROLD HARTLEY was appointed president of the British Association for the Advancement of Science, for 1950. DR. IAN CLUNES ROSS was appointed chairman of the (Australian) CSIR.

For his book, "An Entry to Organic Chemistry," PROF. JOHN READ, University of St. Andrews, awarded £500 prize by the city of Cortina d'Ampezzo and the Italian review, *Ulisse*. American Chemical Society honours included: DR. G. E. F. LUNDELL, the $1000 Fischer award in analytical chemistry; DR. ARTHUR B. LAMB, retiring editor of the *Journal of the American Chemical Society*, received the Priestley Medal; DR. BRUCE H. SAGE, the $1000 Precision Scientific Company award in petroleum chemistry; DR. RICHARD T. ARNOLD, the $1000 ACS award in pure chemistry.

SIR ALFRED EGERTON received an honorary degree at Helsinki of the Finnish Institute of Technology. DR. A. J. GUINIER was awarded the 1949 Charles Vernon Boys prize of the Physical Society. DR. WILLIAM F. HESTER named administrator of the fellowships of Koppers Company, Inc., at Mellon Institute. The National Smoke Abatement Society appointed as its new president, DAME VERA LAUGHTON MATHEWS.

Obituary: Mr. E. T. Stannard, Mr. R. J. Parker, Mr. Arthur D. Storke.

OCTOBER

THE completion of one of the most elaborate surveys yet produced was announced by the Association of British Chemical Manufacturers, "a comprehensive Survey of Chemical Industry." This was compiled in compliance with a request by the President of the Board of Trade, from numerous questionnaires circulated throughout various sections of the industry and imposed a heavy task of classification and discrimination. Many undertakings commonly regarded as part of chemical industry were not included. The report, which was intended to reflect chemical industries' plans for research and production development for five years, has not been published.

A gift by Imperial Chemical Industries, Ltd., of £12,000 for research fellowships in chemistry, physics and biology at Pakistan universities was accepted by the Pakistan Association for the Cultivation of Science.

Proposals to extend the list of noxious or offensive gases mentioned in the Alkali, etc., Works Act 1906, were made in a draft order prepared by the Ministry of Health. Individual objections were raised to the inclusion of carbon black works.

The second stage of its development scheme, involving expenditure of £8 million, was announced by Dorman Long & Co., Ltd., as being put in hand immediately.

Prospecting at Halkyn, Flintshire, was expected to lead to the opening up of lead deposits.

Problems of locating, mining and processing radioactive ores were discussed at a technical conference in London of atomic experts representing Great Britain, Canada and the U.S.A.

Names were announced of the first eight of 50 British scientists and technologists who will receive advanced technological training and practical instruction in American production methods under the technical assistance programme of the Economic Co-Operation Administration.

Formal recognition given to new names for a number of elements at the International Union of Chemistry in Amsterdam was reported at the 116th International meeting of the American Chemical Society.

Chemicals, oils, gums and resins were among the wide range of goods released from import licensing restrictions announced in the House of Commons by the President of the Board of Trade.

New materials and techniques were demonstrated at the first Packaging Exhibition, opened by Sir Robert Sinclair at the City Hall, Deansgate, Manchester.

Report on the ammonium nitrate explosions which resulted in the Texas City disaster on April 16, 1947, issued by the U.S. Department of the Interior, Bureau of Mines, Washington.

Prof. E. N. da C. Andrade, F.R.S., was named as the next director (in 1950) of the Royal Institution and of the Davy-Faraday Research Laboratory, succeeding Prof. E. K. Rideal

International Union of Leather Trades' Chemists held its first congress in Paris.

Chemical risks and safeguards were discussed at Scarborough at the second conference organised on behalf of the Association of British Chemical Manufacturers by the Royal Society for the Prevention of Accidents.

New chemical laboratories of Doulton & Co., Ltd., were opened at Tamworth, Staffordshire.

A new explosive—Unibel—for use in coal mining was introduced by Imperial Chemical Industries, Ltd.

A new section of the Royal Institute of Chemistry was formed in Dundee to serve the city, and the counties of Angus, Perth and Fife.

A big improvement in exports was recorded at the 25th annual meeting in London of the British Sulphate of Copper Association.

Eight new Fellows and 37 Associates were successful in the RIC September examinations.

Chemical exports in October showed an increase in value when compared with both September and the corresponding month of 1948. Total figure amounted to £7,640,808 an increase of £470,082 over October, 1948.

Exports of chemicals from the U.S.A. for the first half of 1949 reached the record total value of $449,549,410.

Steel production in October was at a new high level, the output of ingots and castings reaching an annual rate of 15,959,000 tons, 53,000 tons more than the previous month.

The Lord President of the Council appointed Mr. A. H. Wilson, Mr. A. H. S. Hinchcliffe, Lord Halsbury and Prof. R. S. Edwards members for five years of the Advisory Council for Scientific Research.

Lord Boyd-Orr was named as the recipient of the Nobel Peace Prize for 1949.

New directors: Mr. P. D. O'Brien and Mr. B. E. A. Vigers assistant managing directors of Laporte Chemicals, Ltd.; Mr. Arthur Cochrane chairman of H. J. Elliott, Ltd.

Obituary: Mr. Stanley Kiver, Dr. Arthur Pillans Laurie, Mr. A. B. Allison, Mr. Alexander O'Beirne, Prof. Thomas S. Price, Dr. J. A. Schedler.

NOVEMBER

CLAIMED to be the largest catalytic oil cracking unit in the world, the new 41,000-barrels-a-day plant of the Esso Standard Oil Company was formally dedicated at Linden, New Jersey.

Financial aid to purchase machinery costing $9 million for the petroleum chemicals plant at Grangemouth, Scotland (the Anglo-Iranian Oil Company and the Distillers Co., Ltd.) was approved by ECA.

The Nobel prize for chemistry was awarded to Prof. W. F. Giaque, professor of chemistry at the University of California and for physics to Dr. Hideki Yakawa, a Japanese scientist who has been visiting professor of theoretical physics at Columbia University, New York, since September 1949.

Royal Medallist: Prof. R. A. Peters

A grant of $4.1 million was agreed by the ECA to finance modernisation and expansion plans of the French oil industry.

An apparatus claimed to be capable of producing radioactive isotopes in a simple manner was demonstrated by the A.S.P. Chemical Co. at Gerrards Cross. The Aspatron was said to make a more effective use of the gamma-neutron exchange process.

A range of commodities from which quantitative restrictions have been removed, in accordance with the OEEC decisions, was disclosed by the West German Minister of Economic Affairs.

The work of the chemist and metallurgist in helping to produce new or better materials and equipment for industrial and domestic building was represented at the 23rd Building Exhibition, at Olympia, London.

The closing of its tar distillation plant at Sunderland, because of the expiration of the lease and uneconomic conditions of the site, was announced by Monsanto Chemicals, Ltd.

A new record of production of steel ingots and castings was set up in November—an annual rate of 16.858 million tons, compared with 15.959 million tons the previous month, and 15.76 million tons in November 1948. This was only slightly lower than the peak figure established in May.

Chemical exports in November showed a decrease in value compared with both October and the same month of 1948. Total value amounted to £6,898,694 compared with £6,961,717 in the same month of 1948.

The Royal Society awarded the Royal Medal to Prof. R. A. Peters, and the Davy Medal to Prof. A. R. Todd. The Perkin Medal was awarded to Mr. E. V. Murphree, president of the Standard Oil Development Co., New York, by the American section of the Society of Chemical Industry. Research scholarship in the application of light alloy to ship construction was awarded by the Aluminium Development Association to Mr. J. B. Caldwell.

Obituary: Mr. S. R. Guggenheim, Mr. George Moores, Mr. A. J. Chapman, Mr. J. P. D. Coleman, Mr. J. R. Hobbins.

DECEMBER

THE start of the first underground gasification project at Newton Spinney, near Chesterfield, was announced by the NCB.

The cessation of dismantling on 11 synthetic rubber and oil plants in Western Germany was announced by the High Commission.

ECA final approval announced of advance of the reduced sum of $6.5 million for the purchase of U.S. equipment for the petroleum chemicals plant of the Anglo-Iranian and Distiller companies at Grangemouth, Scotland.

The large crude oil refinery at Stanlow, Cheshire, was put into operation a month ahead of schedule. The Shell Petroleum Co. estimated that the refinery would deal initially with one million tons of crude oil a year.

The first full trial of the frequency modulated cyclotron was carried out successfully at Harwell, Berks. Work was suspended on the construction of the atomic pile project at Sellafield, Cumberland.

A new institute for seaweed research, headed by Prof. Henrik Printz, was founded by the Royal Norwegian Council for Scientific and Industrial Research.

The first quantity production of hydrazine hydrate was announced by British manufacturers.

Dr. H. Levinstein was re-elected president of the British Association of Chemists.

A concentrate of vitamin B_{12} obtained from deep-fermentation of the mould *Streptomyces*, was marketed by Glaxo Laboratories, Ltd.

Changes with far reaching effects on the safeguards which industries and other interests would be obliged to take to minimise the discharge of noxious material into streams and rivers were outlined in the report of the Rivers Pollution Sub-committee of the Central Advisory Water Committee.

Surveys of supply and demand for chemists and physicists in Government service, industry, research and teaching, showing the need of greatly increased numbers over the next five years, were published by the Ministry of Labour and National Service.

The removal of import restrictions on a further wide range of chemical and other goods was announced by European Governments in accordance with the agreement with the OEEC for the liberalisation of European trade.

The Board of Trade announced that the Token Import Scheme would be continued in 1950 on the same basis as 1949.

Allegations that the North British Aluminium Co. was not fulfilling its obligation rapidly to prevent fluoride emission were made at the Court of Session, Edinburgh, when proceedings were resumed on claims that noxious fumes from the company's plant were causing harm to animal and vegetable life.

Expansion of its British overseas plants to produce flat glass was announced by Pilkington Brothers. One new factory, estimated to cost $8 million, near Toronto, and another in South Africa, are expected to be in production by 1951.

American advances in new chemicals, in chemical processing and methods of evaluation were demonstrated at the 22nd Exposition of Chemical Industries in New York.

World consumption of fertiliser nitrogen in 1948/49 reached the record figure of about 3.5 million metric tons, according to the 29th annual report of the British Sulphate of Ammonia Federation.

Vermiculite, compounded with sand and Ciment fondu, was used by a Wolverhampton firm to produce a new grooved insulating brick.

A new technique employing radioactive tracer gas for the accurate location of leaks in pneumatic systems was notified by the British Thomson-Houston Co., Ltd., Rugby.

The new chemistry department at King's College, Newcastle-on-Tyne, was opened by Sir Robert Robinson.

Hazards of fire and explosion were the cause of many accidents in 1948. Gases accounted for 412, liquids 478, and solids and dusts 484, according to the annual report of the Chief Inspector of Factories.

India's requirements of chemicals and fertilisers were reviewed in a survey made by Mr. Rowland Owen (senior U.K. trade commissioner) published by HMSO. Important raw materials for her chemical industry had been lost to India by the separation from Pakistan.

SIR GRAHAM CUNNINGHAM resigned the chairmanship of the Dollar Exports Board. PROF. DAVID CAMPBELL was elected president of the General Medical Council.

Obituary: Lady Mond, Mr. Elias Goldberg, Mr. Bernard R. Armour, Mr. Alexander R. Anderson, Mr. T. P. Ward, Mr. Peter Irvine, Prof. Hubert Kappen, Mr. Evan C. Evans.

PROGRESS IN POLYMER PRODUCTION

Few New Plastics Introduced in 1949

by PAUL I. SMITH

DURING 1949 relatively few new plastics were introduced but notable progress was made in the production of known polymers in more marketable forms, and also in the improvement of fabricating methods and the development of new applications for both thermosetting and thermoplastic resins.

Fluorinated plastics now comprise several materials: polytetrafluoroethylene or PTFE, polyvinyl fluoride or PVF and polymonochlorotrifluoroethylene or KEL-F. In Great Britain only PTFE is available in commercial quantities.

The starting material is difluoromonochloromethane, $CHClF_2$ (Freon gas), which is prepared by the reaction of chloroform with anhydrous hydrofluoric acid. The gas, which boils at -40.8°C. is passed through a pyrolysis tube of inert material, preferably platinum, at temperatures in the range of 600-800°C. when monomeric tetrafluoroethylene, C_2F_4, and hydrochloric acid are formed. The monomer, after purification, is polymerised in a stainless steel autoclave containing an aqueous solution of ammonium persulphate or other peroxy catalyst. The polymer $(C_2F_4)_n$ is a granular white solid.

Uses for PTFE

Principal uses so far found for PTFE are in the electrical and chemical fields; in the latter its application as a packing for nitric acid plants, petroleum refining processes, etc., is assuming growing importance. PTFE rings are now being made containing no lubricant and also impregnated with graphite throughout the fibrous structure. These packings are not affected by any solvent acid mixtures, acids or caustic solutions at temperatures up to 690°F. It is claimed that their non-adhesive properties prevent excessive wear of reciprocating rods, shafts and valve stems.

Polyvinyl fluoride can be made by injecting 100 parts of vinyl fluoride containing traces of acetylene and oxygen into a silver-lined reaction vessel containing 120 parts of deoxygenated water and 80 parts of pure methanol and 0.2 parts of benzoyl peroxide. Heating and agitation followed by introduction of fresh vinyl fluoride brings about polymerisation.

So far no great progress seems to have been made with polyvinyl fluoride and experiments have been handicapped by its explosive nature when subject to temperatures in the region of 250°C.

KEL-F has all the appearance of being a most useful addition to the range of fluorinated plastics. It is slightly inferior in chemical resistance, thermal properties and electrical insulation to PTFE but has the advantage of being easier to fabricate on conventional machines. Increasing interest is being taken in polyethylenimine, which was produced in Germany prior to 1944 by I.G. Farben at Ludwigshafen.

Paper Pulp Treatment

Investigation has shown that this polymer is of outstanding value for the treatment of paper pulp for making handkerchiefs, cleaning tissues, shoe insoles, gaskets and all types of absorbent papers, anchor coatings for regenerated cellulose film, waterproofing textile materials and as a hydrophobising agent for rayon and as a cross linking agent for wool.

One process for making the monomer involves the reaction of monoethanolamine with sulphuric acid to produce beta-aminoethyl hydroxide to yield ethylenimine. This monomeric gas is very inflammable, can polymerise with explosive violence and is highly toxic. At the Ludwigshafen plant the monomer was polymerised as it distilled from the preparation kettle and in this way the handling of the monomer was avoided.

One of the most interesting of the newer forms of familiar plastics is an alkyd moulding compound which was first introduced in 1948 but was not employed to any great extent until 1949. This resin possesses a phenomenally high arc resistance and tracking will not occur.

The high heat resistance—ASTM tests show its heat distortion point to be between 350° and 400°F.—excellent dimensional stability when exposed to dry or very humid conditions of use and very low moisture resistance and indifference to all organic solvents and dilute acids, make this new moulding compound of exceptional interest to the electrical trades and the chemical and engineering industries.

Alkyd resin is the fastest curing moulding material commercially available. When it is heated in the moulds for a period of two seconds it becomes very plastic, nearly attaining a fluid state. It can, therefore, be moulded at lower pressures (500 to 900 p.s.i.) than conventional materials. As no gases are given off during moulding, alkyd compounds are particularly suitable for automatic moulding procedure.

Alkyd Mouldings

To the moulding industry alkyd is very attractive as instead of the massive highly expensive hydraulic presses necessary for phenolic and urea powders, a small, inexpensive air-operated press can be used with alkyd to give equally good results.

A revival of interest in the polyester resins, such as alkyd diallyl phthalate polyester, which are used with glass fibres for the production of a wide range of reinforced mouldings, occurred during the year. Some of these are produced at pressures as high as 1000 p.s.i., at low pressures of 50 p.s.i. and at no pressure.

Fibre glass reinforced plastics have been used for all manner of products ranging from small parts of electric wiring devices to casting rods and fly rods for the angler, aircraft structural parts and up to the hulls of motor boats of considerable size. Using fibre glass plastics, articles having strength-weight ratios in excess of those of any known material including stainless steel aluminium and magnesium can be obtained. Moreover, these possess an impact resistance greater than that of most metals either in strength-weight or equal thickness basis.

The manufacture of fibre-glass reinforced plastics is simple. The fluid resins are combined with the reinforcing fabric or mat on the inside or on the surface of a mould made of low cost, easily washed materials. In some cases, the prepared mould is enclosed in a bag-like envelope from which the air is exhausted to apply atmospheric pressures that hold the uncured, reinforced resin snugly to the mould. The whole unit is then placed in an oven at a moderate temperature and in a relatively short time a completed product is ready for removal from the mould for trimming and finishing.

Notable progress has been made in America with styrene-butadiene polymers and also co-polymers of styrene and isobutylene. The first named are horny substances which need compounding with rubber to produce compositions possessing great toughness, high impact strength and heat resistance. Applications so far found for these new plastic-rubber mixes include shoe-soles, floor coverings, golf ball covers, shipping containers and carrying cases.

The styrene-isobutylene plastics are characterised by rubber-like elastic properties and low permeability to moisture and gases. They are therefore calendered to form film for the packaging of foodstuffs, particularly fruit and other commodities where moisture needs to be retained but transmission of oxygen and carbon dioxide can take place. Acrylonitrile polymers can be used in combination with butadiene-acrylonitrile rubbers for the production of tough plastics.

Interesting elastomeric co-polymers are now being produced from vinylidene chloride and butadiene using a low butadiene content and a high percentage of vinylidene. These are similar in some respects to the styrene-butadiene but possess greater toughness and superior ageing properties.

A notable increase in the use of furfural and its derivatives in resin making has taken place during the last two years. Interest now is not so much centred on direct aldehyde condensations but the formation of high polymers through ether linkages; methylene bridging from furfuryl alcohol reaction and addition polymerisation through conjugated furan ring.

It is considered that the Diels-Alder addition products offer great potentialities and may make possible the setting or cross linking of the furfuryl alcohol polymers to form low pressure laminating resins and more flexible type phenol aldehyde resins.

Electrical Properties

Polyvinyl carbazole is a new thermoplastic similar in some respects to polystyrene but possessing superior thermal properties; it has a heat distortion point of up to 150°C., compared with about 80°C. for polystyrene. The electrical properties of this new resin are of exceptional interest where a very low power factor is required.

The monomer, which melts at 70°C., can be used for the impregnation of electrical components and may be polymerised by heat treatment. Compression or injection moulding can be carried out with equal success. At high temperatures the polymer can be stretched to form a highly fibrous asbestos-like material which may be used as a reinforcing filler for moulding ordinary polyvinyl carbazole. Such mouldings can be accurately machined.

Polystyrene is now being produced possessing improved light stability, greater toughness and heat resistance. By control of molecular chain forms in the polymer it is possible to produce greatly improved material. The ASTM heat distortion temperature of one grade of modified polystyrene is 192° F. (89° C.) which is considerably higher than unmodified polymer; properly moulded parts have a maximum service temperature of 180° F. (82° C.). Mouldings of modified styrene have outstanding weathering characteristics and stand up under continuous outdoor exposure, in all kinds of weather, without crazing or warping.

A new resinous hydrocarbon is now being produced by the catalytic condensation of specific alkyl naphthalenes followed by purification and high vacuum distillation. The various grades of this new polymer have tackiness, non-volatility and electrical properties comparable with polybutenes, but are opposite in viscosity index and solvent power. This new plastic is recommended for vinyl insulated wire, cable filling, rigid vinyl mouldings, adhesives and sealing compounds, vinyl floor tiles and composition rollers.

One grade of nylon moulding powder is now being produced in Great Britain for the injection moulding of small engineering parts, particularly nuts, cams and bearings which require no lubrication.

Nylon Machinery Bearings

In the textile industry oil has long been a problem in the making of yarn. During spinning, the yarn is drawn through rollers that stretch and align the fibres. The parts that keep the rollers weighted and in place are called " saddles " and " cap bars." The bearing surfaces of these require frequent time-consuming oiling. An average mill may have as many as 135,000 such places to oil as often as once a day. Frequently, oil gets on the rollers and is transferred to the yarn necessitating costly cleaning and, in addition, the oily rollers pick up lint that must be removed by hand. When the oil supply on the bearings gets low, the rollers slow down and cause uneven spinning.

Nylon bearings eliminate oiling, reduce yarn damage, help maintain uniform yarn quality, end roll-picking and reduce average power consumption. Another interesting use for nylon mouldings is found in the chemical industry where nylon valve seats for gas containers holding hydrogen, propane, carbon dioxide or compressed air are able to stand up to service conditions for much longer periods than the more usual valve materials; they are now softened by lubricants and able to withstand high compression temperatures.

Until 1949 nylon was only available in the natural cream colour, but during last year Du Pont offered polymers in a range of 16 attractive colours. These are not affected by moulding temperatures and articles moulded of the coloured grades have the same resistance to heat as do items of the natural material. Coloured nylon mouldings can be sterilised by steam.

Melamine Resins

Experience with melamine has shown it to be an extremely valuable thermosetting resin. Melamine plastics are now being produced in various forms: alpha-cellulose-filled melamine formaldehyde moulding compounds; chopped, cotton-cloth-filled, melamine formaldehyde material; mineral filled melamine formaldehyde moulding compound; unfilled melamine formaldehyde resin and chopped cotton-cloth filled, phenol-melamine formaldehyde thermosetting moulding compound.

All these melamine plastics form odourless, tasteless and chemically inert moulding compounds which possess exceptional mechanical and electrical properties. The alpha-cellulose-filled resin is particularly useful for buttons, lighting fixtures and reflectors; the mineral-filled melamine for aircraft, automobile and tractor ignition parts, circuit breakers, terminal blocks and electric insulating applications: the chopped cotton-fabric-filled melamine is excellent for uses requiring resistance to shock, *e.g.*, food trap, circuit breakers, insulation on electric motors, mining machinery and tableware.

Cellulose acetate butyrate is becoming of greater importance than cellulose acetate on account of its superior dimensional stability, or resistance to distortion under varying conditions of temperature and humidity.

This is due in part to the less hygroscopic nature of the mixed ester and to the fact that it requires much less plasticiser to obtain a given degree of flow. It is also possible with the acetate butyrate to use plasticisers that have higher boiling points, lower vapour pressures and greater compatability with the ester than those suitable for use with cellulose acetate. Moulding compounds based on the mixed ester require less pressure for moulding or extrusion than does cellulose acetate of the same flow.

Several additions have been made to the already extensive range of synthetic resins based on rosin and used mostly in the coating field. Of these the most important to-day are the pentaerythritol esters of rosin, the heat sealing alkyd resins based on resinous terpene polybasic acid and the ethylene glycol esters of polymerised and hydrogenated rosin.

These are all used in various ways in the formulation of lacquers, varnishes and adhesives, *e.g.*, hydrogenated rosin-modified alkyd resin is used as the hard resin component in interior nitrocellulose lacquers and in cold-check-resistant furniture lacquers. One firm specialising in resins made from rosin produces twelve complete families of terpene resins, the simplest being the methyl ester of a rosin which is employed as plasticiser, as a plasticising co-solvent, and as a resin extender and modifier.

Polyacrylonitrile Fibre

The new Du Pont polyacrylonitrile fibre was made available in commercial quantities during 1949. It is spun in a similar way to cellulose acetate. Solvents used are dimethyl formamide, dimethyl methozyacetamide, tetramethylene sulphone and *m*- and *p*-nitrophenols. Resistance of the fibre to outdoor exposure is good but nylon has greater resistance to abrasion and alkalis.

Film is characterised by its warmth and bulking properties which are caused by its irregular " dog-bone " cross section, while its bark-like striated surface accounts for surface wettability and adhesion to resins and rubbers. Owing to the high resistance of polyacrylonitrile fibre to microbiological attack it is likely to find many applications in tropical climates.

Another new synthetic fibre " Vinyon-N " or vinyl chloride-acrylonitrile fibres possesses excellent resistance to mildew, ability to withstand hot ironing, good light stability and excellent ageing properties. Spun " Vinyon-N " yarn is stretched 900 or 1300 per cent at about 120°C. in steam, when the tenacity is raised to ½ g. per denier.

Polystyrene monofilaments were produced in the U.S.A. during 1949. To date, brushes made of these monofils have been commercially used in whisk brooms and floor brooms where the electrostatic quality of the material helps the brush pick up dust and lint.

Vinyl monofils ranging from 0.008 to 0.022 in. are being added to the list of tufting materials. Main disadvantages are low service temperature and readiness to fray above 140°F.

Unplasticised polyvinyl chloride yarn is now being produced in France for use in making cloth for filters, tissues in orthopædics, for upholstering, in the form of ropes, belts, strings and packings. The yarn has excellent physical properties and possesses good resistance to acids, alkalis and other corrosive agents. The cloth woven from PVC fibres is non-inflammable; in fact it shrinks away from the flame as the source of heat approaches.

Filter cloth made from unplasticised PVC is unaffected by aqua regia, caustic potash solution (50 per cent), caustic soda (36 per cent), concentrated sodium hypochlorite solution and concentrated nitric acid. Organic solvents such as ethyl alcohol, ethyl ether, carbon tetrachloride and amyl acetate have no injurious effect. The cloth is specially suitable for filtering gases and the filtration of extremely fine particles.

The esters of fatty acids are being used to an increasing extent as non-migrating plasticisers for the vinyls; in particular the recinoleates, stearates, oleates and azelates are of importance. The 2-ethyl hexyl ester of azelaic acid has a number of outstanding properties which make it an ideal primary plasticiser. Among these are low volatility and high water resistance and ability to impart low temperature flexibility to films which are clear, free from haze and possess excellent tear strength.

The 2-ethyl butyl ester of azelaic acid is also used for vinyl sheets and film. Both these esters are preferable to the better known dioctyl azelate which has the disadvantage of being highly extractable from stocks by oil and water.

Flexibility

Solvent type plasticisers, such as the diethylene glycol ester of pelargonic acid, combine high degree of flexibility over a wide temperature range and exceptional performance at low temperatures. Films possess high tensile strength and good elongation.

Another new plasticiser is tetrahydrofurfuryl oleate which shows excellent light and heat stability and in addition to providing exceptional internal lubrication it blends with primary plasticisers having poor stability and flexibility to minimise these deficiencies.

Di-butoxyethyl adipate, di-2-ethylhexyl adipate and di-iso-octyl adipate are among the most important of new adipates. These impart permanent flexibility, good electrical properties, extremely low temperature flexibility, low water extraction, good heat stability, stability to ultra-violet light and easy processing.

The alkyl tetrachlorophthalates have been evaluated as plasticisers; the *n*-propyl, *n*-butyl, isoamyl, 2-ethyl butyl, 2-ethyl-hexyl and methoxyethyl diesters are non-migrating, flame resistant and particularly suitable for cellulose esters and nitrile-type rubbers.

MODIFYING SYNTHETIC RESINS

Useful Properties of a Newer Aldehyde

A GOOD deal of interest is now being shown in propionaldehyde. This, although well known to organic chemists, has not hitherto been available in large commercial quantities. Generally speaking, the aldehyde has properties midway between acetaldehyde and butyraldehyde, both of which are fairly extensively used in plastics manufacture, particularly for the production of vinyl resins, cellulose compounds and thermosetting resins.

The chief value of propionaldehyde lies in the fact that it may be used with advantage to secure modified properties in many plastics products where other aldehydes are normally used. So far, it has been used alone or in combination with other aldehydes in the synthesis of polyvinyl acetal type resins and thermosetting plastics. It is claimed that when used with formaldehyde in the phenolic resin condensation process it improves the flow characteristics and moulding properties of the powder produced.

Apart from its direct use in resin making, propionaldehyde is likely to play an important part in the manufacture of new chemical raw materials for producing alkyd resins, plasticisers and cellulose esters.

Under alkaline conditions the aldehyde will condense with formaldehyde to form a trihydroxy alcohol, penta-glycerol, which is superior to either glycerine or pentaerythritol in producing high grade ester resins for paint manufacture.

Another alcohol 2-methyl pentanol, can also be made from propionaldehyde by condensing the aldehyde with itself under alkaline conditions. In this way an aldol is formed which can be dehydrated and hydrogenated to form the hexyl alcohol. By direct hydrogenation the aldol will give the glycol 2-methyl 1, 3-pentanediol, which is now assuming growing importance in industry, chiefly because it forms diesters which are valuable as plasticisers, resins and emulsifying agents.

Propionic acid obtained by oxidation of the aldehyde is used in the manufacture of cellulose acetate propionate, which is finding some applications where cellulose acetate has not been particularly satisfactory. Generally, the mixed cellulose esters, notably cellulose acetate butyrate and cellulose acetate propionate, have better moisture resistance, increased solubility in a wider range of solvents, and a higher compatibility with gums and resins than the straight ester.

The acetate propionate is normally produced by esterifying cotton linters with the mixed acetate and propionic acids in the presence of acetic anhydride and sulphuric acid.

The boiling point of propionaldehyde is 48.8° C, flash point TAG open cup 15-19° F., and melting point −81° C. The specific gravity is 0.8066 and 20° C. and refractive index

$$n \frac{20^\circ \text{ C.}}{\text{D}} 1.3636.$$

This aldehyde has a water solubility of 17 grams/100 c.c. water at 20° C. and is completely soluble in alcohol and ether.

Propionaldehyde usually contains a small percentage of propionic acid and a good quality comercial grade may have about 0.2-0.3 per cent of the acid present. The aldehyde has a suffocating odour and a toxicily comparable with that of acetaldehyde and butyraldehyde.

Reducing the Fire Hazards of Films

PROBLEMS of producing for cinematograph films a safe material which is slow burning and yet possesses satisfactory mechanical and physical properties have long been the concern of film stock manufacturers.

Attempts to produce such film have generally met with little success because the film became brittle after a few projections.

A new type of safety film, produced by Kodak, Ltd., and in small-scale use, holds out better prospects. It is claimed that the new safety material, unlike nitrate film, maintains its essential properties in use and in store. It has an exceptionally low rate of shrinkage. Splicing, however, is reported to be rather more difficult, requiring a special cement.

Inflammability of the new safety material is regarded as being equivalent to that of a roll of ordinary newsprint. It burns slowly and can be readily extinguished by normal means. Fumes produced in burning are not permanently damaging to human tissues, as those from a nitrate film may be.

CONSTRUCTIVE APPLICATIONS OF ATOMIC ENERGY

What are the Prospects?

by J. BERKOVITCH, M.Sc. (Tech.), A.R.I.C.

IF the world's present total energy requirement could be produced by the pure transformation of mass into energy only 0.1 tons of fuel per year would be required. If the energy were to come from U 235, 100 tons of it would be required, but if by thermonuclear reactions of nuclei of low mass (*e.g.*, H^+ as in the sun) only 10 tons of fuel would be needed. Since the world energy requirement is estimated to be about 2.5×10^{12} kWh, the vast potentiality of the atomic source becomes apparent. Other estimates have differed a little from this, but the order of magnitude has been the same.

Speculation

Atomic energy prospects remain enveloped in a cloud of speculation, so that the facts, including those which have come to light this year, deserve to be recorded. The historical basis is primarily associated with Röntgen's observations in 1896 of the fluorescence of a barium platinocyanide screen when exposed to X-rays. This gave rise to the train of work which led to the atomic bomb and the atomic pile.

Rutherford in 1919, after much intermediate work, achieved the artificial disintegration of nuclei by α-particle bombardment

$$N^{14}_{7} + He^{4}_{2} \rightarrow O^{17}_{8} + H^{1}_{1}$$

This was found to be possible for a range of light elements, excluding carbon and oxygen. The α-particles, small, having high energy, occasionally hit a nucleus, producing disintegration. Now the physicists began bombardment with artificially accelerated particles, for instance, protons accelerated in cyclotron.

Artificially Induced Radioactivity

Discovery of artificially induced radioactivity by Curie and Joliot soon followed, in 1934. This has been represented thus:

$$Al^{27}_{13} + He^{4}_{2} = Si^{30}_{14} + H^{1}_{1}$$

$$Al^{27}_{13} + He^{4}_{2} = P^{30}_{15} + n^{1}_{0}$$

followed by

$$P^{30}_{15} = Si^{30}_{14} + e^{+}$$

If the aluminium after bombardment is dissolved in acid the gas evolved is radioactive, due to the active phosphorus in the phosphine.

Neutrons penetrate readily and are readily captured, since there is no charge and therefore no repulsion to overcome. Fermi found slow neutrons to be more readily captured than fast. An early discovered reaction was

$$Al^{27}_{13} + n^{1}_{0} \rightarrow Al^{28}_{13} \rightarrow Si^{28}_{14} + e^{-}$$

First samples of the "artificial" element plutonium were made in the cyclotron:—

$$U^{238}_{92}\ (d:\ 2n) \rightarrow Np^{238}_{92} \rightarrow \beta \rightarrow Pu^{238}_{94} \xrightarrow{a} U^{234}_{92}$$

In the pile

$$U^{238}_{92}\ (n:\ \gamma) \xrightarrow[\text{ultimately}]{} Pu^{239}_{94}$$

(In this notation, the first symbol represents the bombarding particle, the second the emitted; d signifies deuteron, n neutron.)

New Elements

The new elements have provided a new radioactive decay series, the 4n + 1 series, which fills a gap in the known series 4n, 4n + 2 and 4n + 3. None of the members of this new series occurs in nature. The end product is Bi^{209}.

Electronic structure of the transuranic elements is analogous to that of the rare earth series. The "build-up" from one element to the next is by an increase in the number of electrons in the 5f shell, which is an inner shell, not in the outermost. Hence, in their chemical properties they are very similar.

The symbols and atomic numbers of the transuranic elements are these:—

Neptunium	Np 93,
Plutonium	Pu 94,
Americium	Am 95,
Curium	Cm 96.

The detection of radiations requires instruments, such as the Geiger-Muller counters for β and γ rays. The counter consists of a metal tube with a wire running through the middle, filled commonly with argon at 10 cm. pressure and a trace of organic vapour, and fitted with a window. The metal case is earthed, the centre wire charged to 100-1500 V. An ionising particle causes multiplication of ions by acceleration and collision and thus produces an amplified detectable impulse. The pulse is self-limiting, due to the formation of a space-charge. Scaling counters are used which apply to an electro-mechanical counter only one pulse in 10 or 100.

α counters consist of an electrical condenser, of which the plates are charged at about 1000 V. potential difference, the specimen being positioned between the plates. Each particle gives a pulse which temporarily lowers the voltage. This effect is used for the detection. Thus the α counter uses the direct ionisation effect but the β counter requires a multiplying effect.

Detecting Neutrons

Neutrons possess no charge and no ionising effect; they give no Wilson chamber track. Hence for their detection a secondary effect is needed. This may be (a) measurement of the radioactivity induced in indium or gold foil, or (b) detection of the α rays produced by permitting the neutrons to impinge on boron

$${}^{10}_{5}\mathrm{B} + {}^{1}_{0}\mathrm{n} \rightarrow {}^{7}_{3}\mathrm{Li} + {}^{4}_{2}\mathrm{He}$$

A general review of instruments in atomic energy work has appeared in this journal.[2]

Applications of atomic energy can be regarded as being of two quite distinct kinds.[3] One is the use of atomic energy for large scale industrial production of electricity and possibly of other forms of power. The other benefit derives from the use of the "by-products" of atomic reactors, such as radio-isotopes. There is a very considerable difference between the two applications.

Power on an industrial scale means the use of large quantities of nuclear fuel and the production of very large quantities of heat. The world's needs of radio-isotopes could be supplied by an amount of atomic power which produced no more heat than would be necessary, converted efficiently into electricity, to supply a large village. The industrial application almost certainly involves the production of fissile substances on a large scale, and these could also be used for the manufacture of atomic bombs on a military scale. It has been stated, however, that the Harwell piles, which are capable of supplying all Europe's needs of radio-isotopes, could scarcely make a fraction of an atomic bomb in a year.

Uses of Isotopes

Uses of isotopes in investigations have been briefly reported in *Nature*.[4] Possible uses directly in industry have been referred to several times in the last year and there are indications of increasing actual use as more and more workers become trained in the technique. The ionising power of the radiations may be used to dissipate static electricity and has in fact been so used in textile, rubber and plastics factories. Sparks may be stabilised by the ionising power of radiation, for instance, in sparking plugs, but the spark voltage is not reduced.

At least two systems of liquid level remote indication have been devised using Po*. Thus, a float may be coated with the isotope and the ionisation current between this and another electrode measured. Current will decrease as the level falls, and the device can be calibrated to allow for decay. It is usable with inflammable liquids.

The penetrative power of radiation may be used as an alternative to X-rays for taking radiographs. Strong γ-radiation of La^{140} may be used for this purpose. Emitting weak β rays C^{14} is used as a source on one side, with a detector on the other side, for accurate measurement of plastic film thickness to better than 10^{-4} in. Similarly, measurement of the thickness of sodium oleate on textile fibres prepared for finishing processes is being carried out using Na^{24}. Use of these techniques for continuous measurement of liquid densities within closed pipes has been suggested.

The Tracer Technique

Use of tracers for analytical purposes has hitherto been thought of mainly as an academic technique. In fact, the principle is directly valuable for industrial investigations. The outstanding merit of the tracer technique is the very low limit of detection. For instance, while phosphorus cannot be detected below perhaps 10^{-6} g. (at the best), P^{32} is detectable down to 3×10^{-15} g. Thus, even with a millionfold dilution there is advantage in using it.

Investigations into the mechanism of rubber vulcanisation and into the source of sulphur in iron—from the coal or the ore—have been carried out with active sulphur.

A recent report by Dr. H. Seligman[4] on "The Availability of Radio-Isotopes" indicates that the Atomic Energy Research Establishment at Harwell is now in a position to provide all the tracers of long life which a year or so ago could be bought only from the United States, as well as those of shorter life, which were previously not obtainable by purchase. The staff at Harwell also go to great lengths to help those with little experience in the subject, by giving advice as to the tracers likely to be most satisfactory in particular research problems and industrial uses. Prices are kept very low and it is, therefore, unlikely that establishments within reasonable distance from Harwell will ever be hampered in the use of radioactive tracers by lack of the necessary radioactive material.

Allocation of Isotopes

The Isotopes Allocation Committee, under Sir John Cockcroft, considers applications for isotopes.

Health records of all laboratories hitherto working in these fields are quite clean. It is evident that the assertions that there need be no greater risk in such work than in any other laboratory work have been well substantiated.

Dr. E. F. Edson has pointed out that there are six major groups of protective barriers and has discussed these:—

(a) Lay-out, design and construction of establishment, (b) operational routines and handling of radioactive materials, (c) training, education and supervision, (d) personal protection of the worker, (e) detection, measurement and control of radioactive hazards, (f) medical surveillance of workers.

In a symposium on "Safety in Laboratories," Mr. W. G. Marley (AERE) has given further useful guidance. He considered inhalation of radioactive material as constituting the major risk. Radiation is prone to attack the lungs.

Protective Clothing

At the same time, deposition in the body might also occur by ingestion or by skin absorption and appropriate safeguards—particularly the use of protective clothing—were necessary for these risks too. A "Film Badge Service" is now operated by the National Physical Laboratory for examination of X-ray film badges worn by all workers who may be exposed to radiation.

Periodical surveys of the laboratory for local contamination should give Geiger counter records of less than 500 per min. Removable bench tops, stainless steel working trays, special impervious flooring, protective clothing, rubber gloves, overshoes and a hat had all been found necessary for protection in routine work.

An important conference on this subject took place between representatives of Great Britain, the United States and Canada on hazards and safety in connection with atomic piles and related subjects at the Atomic Energy Research Establishment, Harwell (August, 1949).

The programme, which did not include weapons information, was mainly concerned with the potential hazards of atomic piles—a consideration which is always foremost in deciding location and design. Delegates to the conference discussed the treatment of radioactive wastes, the effects of radiation on plants, animals and human beings, and pile hazards which might arise from accidents, sabotage, or the failure of safety controls. So far, no statement has been issued.

The Ministry of Health has appointed a Radioactive Substances Advisory Committee under the chairmanship of Sir Henry Dale, O.M., F.R.S. This is to advise on measures to safeguard workpeople and the public generally against the danger of exposure to radiation from radioactive substances and certain irradiating apparatus.

Precise Measurement

This work clearly requires the employment of precise standards of measurement. Steps are to be taken to provide them in the new international standard adopted by the International Unions of Chemistry and of Physics and recently referred to in *Nature*.[5] As a temporary measure the "international curie" is to signify 3.6×10^{10} disintegrations per second, superseding all previous definitions. There are also proposals for ultimately defining and using the rutherford as a firm international standard.

Some doubt has been felt about the effectiveness of the Aspatron, a "miniature" pile, briefly described in this journal.[11] This device, resembling a large tea-urn and carrying a maximum load of only 34 lb. of uranium oxide, is intended as a source of radioactive isotopes of short life.

In the orthodox pile, in addition to a high neutron density, there is a considerable amount of gamma radiation which contributes nothing to the efficiency of the chain reaction and is therefore useless from the point of view of the utilisation of atomic energy. Design of this new small unit has been directed towards using gamma radiation to good effect.

It is known that certain elements respond more readily to this so-called " photo-disintegration " than do others. The particular element employed in the Aspatron has a relatively high gamma-neutron cross-section and a disintegration threshold-energy apparently slightly lower than the theoretical value. The Aspatron is intended to make effective use of the gamma-neutron exchange process, and so enhance the efficiency. Normal sources of neutrons (fissionable nuclei) are also present and the useless capture of neutrons by the copper in the assembly is guarded against by the critical " thinness " in construction.

Official comment on these claims is reserved. Sir John Cockcroft, however, has made it clear that calculations and measurements related to similar principles during the last 10 years by the Department of Scientific and Industrial Research have not been rewarding.

The revolutionary suggested use of atomic energy for power purposes is for the propulsion of rockets, which has been the subject of a series of articles in the *Journal* of the British Inter-planetary Society.[6] The one conspicuous fact here is the existence of great technical difficulties, which are shared by all such mobile power projects, in which massive shielding is clearly impossible.

U.S. Pilot Plant

According to Mr. T. R. Hogness, director of the Institute of Radiobiology and Biophysics of the University of Chicago, the U.S.A. will have an atomic energy pilot power plant of at least some hundreds of horsepower within five years, and one or more plants of 100,000 horsepower, or more, in 20 years. Assuming that the atomic energy power plant will use the breeder principle, operations (including refining) could cost $10,000 per lb. While plant costs would be high, labour costs would be relatively small after the plant is built.

The Argonne laboratory in Chicago has completed an engineering design for an experimental breeder reactor which will be finished in about a year. The breeder reactor will test the feasibility of breeding with fast neutrons. It is claimed as the biggest step forward in the peacetime application of atomic energy.

It is theoretically possible with this reactor to convert U.238 into usable material. At present only about 0.7 per cent of natural uranium is usable, the rest being U.238. If wholly successful, the breeder reactor will use the whole of natural uranium and thereby multiply by 140 the amount of usable material. It appears unlikely, however, that this result will be achieved. These experiments may nevertheless be an important factor in easing the problem of increasing the supply of fissionable material.

For more than three years, American industrial scientists have been working with the Oak Ridge National Laboratory and more recently with the Argonne National Laboratory to lay the groundwork for a special atomic power plant for naval ship propulsion. Detailed engineering designing will begin in about a year and it is hoped that construction will be under way by 1952. The ship-propulsion reactor will be a single-purpose machine designed to produce large amounts of heat for conversion into power.

Economic Aspects

The much more difficult and far-reaching part of the problem, the economic aspects, have been receiving serious study. While it is difficult to summarise their arguments here, a number of important references are given.[7]

Electric generating stations are expected to present the least difficult of the problems of peaceful utilisation, and a leader as cautious as Sir John Cockcroft, the head of the Harwell research establishment, is able to foresee the existence of such experimental power stations within the next few years. In those conditions, he notes, the present energy consumption of the world could be met by the complete fission of as little as 250 tons of uranium a year. In the U.S. Atomic Energy Commission's report of a year ago it was felt safe to say that if the present effort to build breeding reactors meets with success it should be possible, with uranium costs at their present level, to create a new fuel industry greater than that based on coal, and at a lower selling cost.

Industrial Blasting

The possibility that atomic material can be used as a " super industrial explosive" is suggested by the official explanation of the U.S.S.R. of the atomic explosions in Russia. The Soviet officials and official news agency claimed that the first explosion was carried out for industrial blasting. The Soviet-licensed Berlin paper *Nacht-Express*[10] soon carried what was represented to be a detailed story of the location and purpose of this explosion. Two giant dams, 800 miles apart, are being built at Turuchansk, on the River Yenisei, and at Troytskoye, on the River Ob. It is claimed that, by moving obstructions by atomic explosion electric power on a scale greater than that from the Dnieper Dam will be made available. The flow of the Tubol River, it is said, will be reversed and an area the size of France—at present desert—between the Aral Sea and the Caspian Sea will be irrigated and rendered fertile.

If successful application of atomic energy for industrial blasting has in fact been made in the U.S.S.R. great technical problems associated with contamination must have been faced.

In this survey main emphasis has been placed on British developments. Great Britain is now operating no fewer than six atomic centres. It must be borne in mind, however, that France is now operating a pile under Prof. Joliot-Curie. During November, 1949, the French Atomic Energy Commission announced that its "plutonium factory" at Le Bouchat, 30 miles south-east of Paris, had produced its first milligram of plutonium, in the form of a purified salt. Further, the commission announces that the atomic pile at Chatillon (France's first atomic pile near Paris) is in a position to furnish regularly similar or slightly larger quantities of this element, which will be used in scientific and technical research on the peaceful applications of atomic energy.

REFERENCES

[1] *Electrical Times*, No. 2987, February 3, 1949.
[2] *Chemical Age*, July 30, 1949, p. 158.
[3] *Atomic Scientists News*, January 1, 1949, II, No. 4, p. 71.
[4] *Nature*, June 18 and 25, and August 27, 1949.
[5] "Safety in Laboratories," Pamphlet published by RIC, 1949.
[6] *J. British Interplanetary Soc.*, L. R. Shepherd, September, November, 1948, and January and March, 1949.
[7] (*a*) "Possibilities of Nuclear Energy for Heat and Power Production," by J. D. Cockcroft, Proc. Inst. Mech. Eng., *156*, p. 206, 1947.
(*b*) "Atomic Power," by Prof. M. H. L. Pryce, *Discovery*, March, 1948, p. 78.
(*c*) "Atomic Power and Economic Development," W. Isard and U. Whitney, *Bull. Atomic Scientists*, March, 1949, p. 73.
(*d*) Report of A.E.C. Industrial Advisory Group, *Ibid*, February, 1949, p. 51.
[8] *Nature*, *164*, No. 4163, p. 263.
[9] "The Military and Economic Consequences of Atomic Energy," Blackett, 1949.
[10] *Nacht-Express*, November 5, 1949.
[11] *Chemical Age*, November 19, 1949, p. 697.

In this survey, the author has avoided any reference to the operation of atomic piles, since these matters have been extensively dealt with in the literature and little fresh information has been disclosed during the year. Apart from a brief historical résumé, the article is devoted mainly to new disclosures during this year, which have bearing on industrial utilisation of atomic energy and its products.

Chemical and Physical Research in South Africa

CONSIDERABLE development in the staff and in its laboratory facilities is reported in the third annual report of the South African Council for Scientific and Industrial Research 1947-1948, which has now been made available.

A wide variety of studies was undertaken by the National Chemical Research Laboratory including the investigation by modern techniques of South African clays of industrial importance.

Apparatus was constructed for the routine measurement of the surface area of paint pigments and for the measurement of surface areas by gas absorption. Attention was also directed to the chemistry of chromium and the citric acid fermentation of cane molasses.

Development of the organic chemistry division was hampered by lack of chemicals, but preliminary studies of wool wax were devoted to the elaboration of analytical methods. The general outlines were determined of the structure of a phenolic component of the timber of *Chlorophora excelsa*.

In the National Physical Laboratory instruments were developed for logging temperature and radioactivity in boreholes under conditions peculiar to South Africa and also for determining very low concentrations of radioactive substances.

A method was evolved for rapidly determining the elastic properties of wool and other textile fibres under dynamic conditions involving no permanent set.

Experiments on the action of hydrogen peroxide on bacteriophage were carried out and, with the aid of the Geiger counter X-ray spectrometer installed in March, 1948, an extensive survey was made of particle size determination. Biological work with phosphorous-32 was also undertaken.

An inquiry into the present and future demand for various types of research workers in South Africa was made by the Research Committee of the Federated Chamber of Industries, which provided a valuable link between the council and industry.

The application of vermiculite in building was reviewed by the materials division, which also investigated the protection of building timbers and the damage done by termites in South Africa.

WIDENING FIELD FOR CATECHOL

Industrial and Medicinal Uses of Phenol Intermediate

WELL known to research chemists for many years, Catechol ($C_6H_4(OH)_2$) is a dihydric phenol which only recently has become available in commercial quantities for general use as an intermediate in the chemical industry.

Of the three dihydric phenols, catechol, hydroquinone and resorcinol, catechol is the most active reducing agent. It reduces solutions of a number of heavy metals, with the precipitation of the metal in a finely divided state. This property is the basis for its use as a photographic developer and as a reagent in the preparation of colloidal suspensions of metals.

In the pure state catechol is a white crystalling solid having a specific gravity of 1.34, melting point 104° C. and boiling point 245° C. at 760 mm. mercury. It is soluble in water, alcohol and acetone but insoluble in ethyl ether and only slightly soluble in benzene, chloroform and carbon tetrachloride. The commercial form of catechol is usually available in two distinct grades—ordinary grade suitable for chemical manufacturing and processing uses, and resublimed grade for medicinal pharmaceutical and photographic purposes. Re-sublimed catechol generally has a minimum purity of 99.6 per cent, against 99 per cent for the commercial phenol: water insoluble matter is about 0.05 per cent maximum for all grades.

Ready Reactor

Catechol is gaining increasing importance in the manufacture of pharmaceuticals dyestuffs, photographic chemicals, rubber vulcanising agents and antioxidants and additives for lubricating oils. Like the monohydric compounds, catechol will undergo typical reactions, such as alkylation, bromination, etherification and oxidation. The dialkyl derivatives of catechol prepared by reactivating the phenol with olefines, alkyl halides, alcohols or esters, or by the reduction of acyl catechols are today assuming considerable importance as antioxidants, polymerisation inhibitors and pharmaceutical intermediates.

One of the products of etherification is piperonal, a perfume synthetic with the odour of heliotrope. This is prepared by first reacting catechol with methylene dichloride to form catechol methylene ether. This is heated with formaldehyde and hydrogen chloride to give piperonyl chloride, an intermediate in the production of piperonal.

Another important method of synthesing piperonal or methylene-protocatechnic aldehyde is by reaction of catechol with chloroform and an alkali hydroxide to form protocatechnic aldehyde (Reimer-Tiemann Reaction). When the dipotassium salt of the aldehyde is reacted with methylene iodide or methylene chloride piperonal is produced.[1]

Other Derivatives

Important pharmaceutical products such as adrenaline and related pressor active compounds, can be produced commercially from chloroaceto catechol. This is made with chloroacetyl chloride in the presence of zinc chloride.

According to Miller, Hasting, Rock and Crossley,[2] the n-heptyl ether of catechol and the alkyl derivative, 4-n-heptyl catechol have phenol coefficients of 37 and 77 respectively when tested against *Staphylococcus aureus*.

Synthetic resins and synthetic tanning agents can be prepared from catechol. Apart from the condensation products obtained by reacting catechol with formaldehyde and acetaldehyde, the monomeric catechol esters containing an unsaturated alkyl group can be readily poymerlised to form products of interest as laminating resins, etc.[3]

An interesting and recent application of catechol condensation products is for the treatment of nylon fabrics to improve their light stability. By condensation of phthalic anhydride with catechol it is possible to obtain two dihydroxy-anthraquinones, of which hystazarin is produced in larger quantities than alizarin.

According to Houben Fortschritte der Heilstoffchemie, part 2, page 201, catechol produces a rise in blood pressure, a slowing of the pulse, and an increase in the blood sugar concentration. In the U.S.A., Koppers Company, Inc., which produces large quantities of catechol for general industrial uses, states that it should be handled with the normal care given to an industrial chemical and that contact with the skin and inhalation of dust or vapour must be avoided.

REFERENCES

[1] Reimer and Tremann, Ber. 9, 1269-1876.

[2] *J. Amer. Chem. Soc.*, *60*, 7 (1938).

[3] Muskat and Strain, USP 2, 395, 932.

The Fuel Industries in 1949

Operations of the Collieries and Coke Ovens

by G. E. FOXWELL, D.Sc., F.Inst.P., F.Inst.F.

THE year 1949 generally has yielded easier coal supplies than any of its predecessors. It is true that the quality of the coal supplied to industry has continued to leave a good deal to be desired, but there has been a greater readiness " to spare the pianist since he was doing his best."

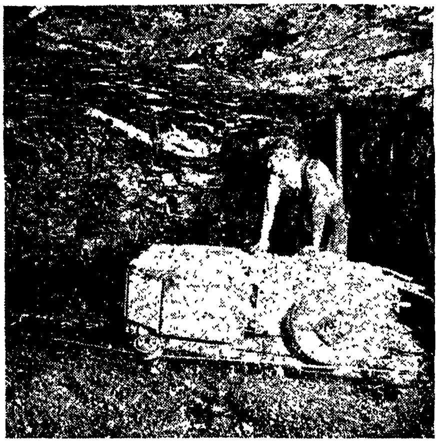
For many reasons, washery plants at the vesting date were insufficient in capacity to deal with the tonnage of coal raised. The growth of mechanical methods of mining has considerably increased the amount of dirt raised and further overloaded already under-capacity washeries. The traditional method of measuring mine output by weight has militated against the production of cleaner coal, greater output can be achieved by taking less care to leave stone underground. The genius who could devise a means of satisfactorily measuring the colliery output in therms would be a benefactor of all coal users. Very large sums are being spent in building new washeries and there is no doubt that coal cleaning will at length be very satisfactory.

Revaluing Coal Types

In pursuance of the announcement, that a new price structure for coal was to be set up, much technical work is being done towards the revaluation of some 8000 coals which must be analysed, classified and placed in an order of merit. The price structure cannot be based wholly on technical evaluation of the properties of the coal but must be based also on economic and commercial facts.

Whether prices should be based on pit-head prices or upon zone-delivered prices, taking into account the scientific evaluation factors, remains a subject of controversy. During the year, opinion appears to have hardened in the general direction of pit-head prices based on technical evaluation, largely on the ground that uniform zone-delivered prices may be unfair to those who have taken the trouble to site their works in a particular district in order to get whatever advantage can be obtained by reduced transport costs.

In the technical evaluation the coals will be classified according to size, method of preparation for the market and rank, these between them determining the main use of any coal. It will be possible to put each of the 8000 coals into four classes of use: gas coals, coking coals, general industrial coals, and house coals.



The Joy-Sullivan mechanical cutter represents a U.S. design to accelerate coal raising now made under licence in this country

Within these groups the coals will be placed in an order of merit based generally on a comparison of the heat content, but account will also be taken of properties which are important to particular users. In gas making, the yield and quality of the gas are the prime factors; whereas for the manufacture of metallurgical coke coking power is the quality sought. This may be described as the " convenience " value of coals, a criterion suggested by Dr. E. S. Grumell (late of I.C.I., Ltd.), in papers before the Institute of Fuel.

After every coal has been provisionally allotted a place in the schedule of relative values, it will still be necessary to re-examine the schedule in the light of commercial experience, to include such characteristics as are difficult to assess scientifically, but have a considerable effect on their value to consumers. Size-distribution, physical hardness, friability, porosity, liability to spontaneous combustion, etc., are typical qualities of this kind.

This work was in fact so far advanced a year ago that a price structure might well have been issued already. Certain difficulties, and the reactions of the largest users to the price structure proposed, have caused the National Coal Board to withhold final decisions. Some immediate anomalies, however, have been removed. These arose from the fact that, during the war, whenever increases in the price of coal became necessary, the Ministry of Fuel sanctioned a flat rate increase in shillings per ton, irrespective of the character of the coal to which it applied. This has resulted in the lowest grades of coal becoming unwanted. The price adjustments that have been made during the year have been designed to remove this fault as far as possible.

The NCB is now working on a general national plan which should be completed by the end of this year. It represents an attempt to adjust the future supply of coal to demand at the lowest possible cost to the country. Generally it may fairly be said the NCB appears to be tackling its problems with vigour—and now with some foresight.

Coke Ovens

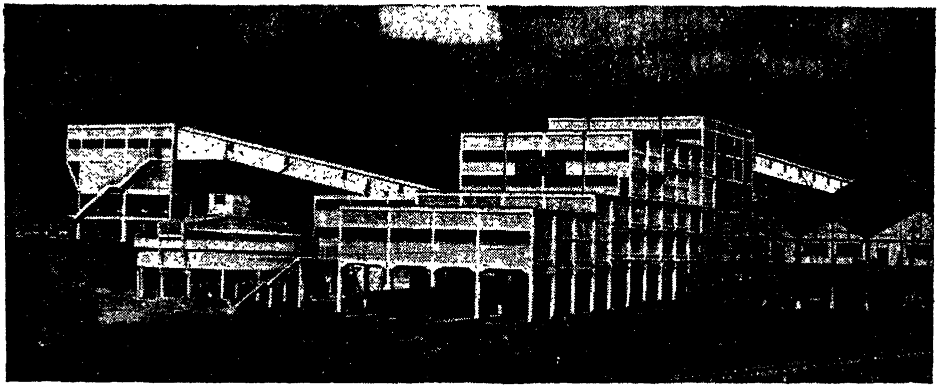
The coke oven industry continues susceptible to being divided between NCB plants and those owned by the iron and steel industry—and a few others. The plants which the iron and steel industry have controlled in 1949 are generally modern, their size and method of operation designed to perform a particular function in the integrated iron and steel works. Most of the plants owned by the NCB are not modern. Difficulties of reconstruction, rebuilding and even of maintenance during the war have placed these plants in urgent need of extensive rebuilding.

R. J. Barritt has pointed out, during the year, that, with very high capital costs for new modern plant, it is rarely possible for a colliery to rebuild completely plants of the existing size and operate them at a profit. The minimum economic size of a coke oven battery requires a capacity of between 1000 and 1500 tons of coal a day. The logical development, if the present economic conditions continue, is that the comparatively small plants now owned by the NCB should gradually be replaced by a smaller number of large central plants drawing their supplies of coal from a number of pits in the neighbourhood. Greater use will be made of blending plant and coal preparation for coking will become a scientific operation.

Inferior Coals

One of the problems of the coke oven industry is the economical use of coals of inferior quality. The solution probably lies in coal preparation, including cleaning, fineness of grinding and blending. Potentially an important factor is the fact that when a coal is partly hydrogenated—and this applies also to non-coking bituminous coals—it becomes plastic or even molten, and on cooling is found to have acquired coking properties in very high degree. It is not impossible that in the future, as our best coking coals are worked out, it may become the practice partly to hydrogenate a percentage of the coal used for carbonisation, by the aid of the end gases rich in hydrogen, and to blend this hydrogenated material with the bulk of the coking coal. Preparation of coal for carbonisa-

(continued on page 74)



The Mosley Common washery, the largest in Britain, which in November was geared to clean 600 tons of coal per hour

FUEL INDUSTRIES IN 1949

GAS ENGINEERING PROBLEMS

Closer Links with Chemical Industry

THE narrow boundary which is supposed to distinguish the main activities of the gas industry from chemical engineering has been rendered a great deal harder to define by many of the trends in commercial gas production during 1949. The nature of the engineering problems in particular have rendered much closer the similarity of interests of gas and chemical producers, which the profound influence the expanding petroleum refining capacity may exercice on both promises to intensify.

Oil Refining Gases

Two of the gas industry's principal problems, meeting high peak demands and the removal of hydrogen sulphide from the normal product, will be substantially eased if oil refining gases become abundant. In that respect gas undertakings are capable of becoming competitors, in the quest for raw material, with some of the chemical synthesis enterprises of the future.

The petroleum industry, when all current refinery schemes are implemented, should be able to refine in this country about 20 million tons of petroleum a year. In the course of doing that large quantities of permanent gases are likely to be produced having a calorific value between about 900 and 1500 BThU/cu. ft.

It has been calculated that the quantity of these gases that might be made available when the full refinery programme is in operation could represent the equivalent of about one-quarter of the total thermal value of the gas now sold by the gas industry. If this gas could be made available for enrichment purposes in the gas industry—as some indeed is—it would greatly reduce the amount of capital expenditure required over the next few years.

Manchester's Intake

During this year Manchester has taken gas of 890 BThU a cu. ft. in amounts which will ultimately rise to 600,000 cu. ft. of gas a day from the Caterole process of Manchester Oil Refineries, Ltd. Ellesmere Port gas undertaking is buying daily 60,000 cu. ft. of gas of 1500 BThU a cu. ft. from the Ellesmere Port refinery of Lobitos Oilfields, Ltd. In addition to this refinery gas it is likely that in the future there will be available considerably greater quantities of coke oven gas and this amount may well be of the order of 15,000 million cu. ft. over the next 5 or 6 years—according to H. D. Greenwood, who also calculates that if the gas industry takes the fullest advantage of coke oven gas it can save an expenditure of some £7 million which would otherwise have to be spent on new carbonising plant at gas works.

Gas shares with chemical industries a further common interest—the high capital cost of the increasingly elaborate plant now considered necessary for securing high quality production and more economical working conditions. That applies equally, of course, to coke ovens. In gas industries it is now being asked if all the cost-raising refinements are essential, in view of the necessity to produce more gas quickly. That, however, is a viewpoint chemical industries are most unlikely to share, in relation to their own affairs.

The curious and in some ways unfortunate emphasis that is now being placed on total gasification is partly due to the insistence of the Gas Research Board in pursuing its own total gasification ideas, based on the Lurgi plant and the (very necessary) effort to "sell" that idea.

Total Gasification

The present writer would not for one moment disagree with the pursuance of this work, for it is a function of the Gas Research Board to reach out into the future and to be ready for whatever may befall. Many industries have died at the hands of a competitive product because they have not been ready to take the necessary action in their own defence.

A method of making gas that enables gas to be the main thermal product (whereas now it amounts to only one-third of the therms produced), and to be made from any type of coal, even low-grade colliery rejects, may well be essential 20 or so years hence. But the emphasis placed on total gasification in order to justify the work to the average engineer will be a positive disservice to the industry if it results—as it appears to be doing—in the belief that coke is a product no one wants.

Coke and gas together given the cheapest means of smokeless heating.

The Gas Research Board has been actively at work on two major processes of gas-making. (1) Gasification at high and low pressures, with or without the use of oxygen, with the fuel in static beds, fluidised or fully entrained, and with hydrogenation; (2) the catalytic synthesis of methane, as enrichment processes.

Consideration of these processes indicates that the gas industry is travelling fast in the direction of chemical engineering, and it is not surprising that at the Autumn Research Meeting there was a vigorous protest, which drew much applause from the large gathering of gas engineers present, against the present policy of the Institution of Gas Engineers of linking its examination syllabus too rigidly with those of the great civil and mechanical engineering institutions, and neglecting linkage with the Institution of Chemical Engineers.

The gas industry can hire civil, mechanical and electrical engineers, it was declared, but gas engineering is now fundamentally a branch of chemical engineering.

Much of the Gas Research Board's work on the gas making processes has been conducted on what may be described as the semi-manufacturing scale. The first process involves work on the hydrogenation of coal and semi-coke during the process of coking, *i.e.*, at elevated temperatures, with production of methane, as in the Lurgi process.

Synthesis of Methane

Operation under pressure has been envisaged to bring about the synthesis of methane by the interaction of the primary gaseous products, hydrogen and carbon monoxide, with coal or coke. Work has been conducted on a static generator using a weakly-caking coal and semi-coke.

The conclusions announced during the year were that the non-coking coal could be successfully treated at 50 atmospheres pressure and that under the conditions employed, 38.8 per cent of the coal is gasified by 33,000 cu. ft. of hydrogen per ton of coal treated, giving 40,000 cu. ft. of gas at a CV of 493 BThU/cu. ft.

In all, the yields from a ton of dry coal were 197 therms of total gas, of which 111 therms was methane, and 90 lb. of sulphate of ammonia was produced simultaneously.

Work is now in progress to enable a non-static generator to be used, and in particular to use the fluidisation technique. In a complete system operated on the fluidised bed principle, oxygen-steam blast would be used for the complete gasification of hot coke leaving the process, to produce from it a mixture of hydrogen and CO. This gaseous mixture, at high temperature, would react under pressure (*e.g.*, 50 atm.) with the raw coal entering the system. The coal would be distilled, methane would be synthesised from hydrogen and the carbon in the fuel, giving a gas suitable in CV for town use.

As an example, at a reaction temperature of 900°C. and at 25 atm. pressure, if the gas is preheated to 665°C., 18 per cent of CH_4 is made. It may be long before these experiments can be considered sufficiently complete to employ the fluidised process on the manufacturing scale. One prior necessity is for sufficiently cheap oxygen.

Oxygen Costs

This is a subject on which information is conflicting. Dr. King, director of the Gas Research Board, delivering the William Young Memorial Lecture, said: "In a recent paper to the American Gas Association Conference, C. C. Wright has quoted costs in the U.S.A. (for 250 tons of O_2/day) of $4-5 a ton, or 17-21c./1000 cu. ft. At this scale, which would mean about 200,000 therms of town gas a day, the cost of oxygen does not seem to be out of the question for base load gas. . . . It is still doubtful, however, whether a plant requiring oxygen could be other than a base-load plant, since a modern oxygen plant cannot be started from scratch in less than 10 hours and its flexibility under running conditions is not more than ± 25."

It may be added that the capital costs of the combined plant might well be sufficiently high at present to rule out anything other than base load operation.

The Gas Research Board has also brought to the pilot plant stage—in this case to a stage at which the process is claimed to be ready for large-scale application—the process for synthetic catalytic production of methane, using the reaction: $CO + 3H_2 = CH_4 + H_2O$. Complete details of the pilot-plant experiments were given to the Autumn Research meeting of the Institution of Gas Engineers by Dr. F. J. Dent and Dr. D. Hebden.

Methane Plant

The technical process appears to be established and it remains for an Area Gas Board to undertake to erect a plant in order to determine its economic value. Synthesis gas in the proportions given in the foregoing equation is passed over a nickel catalyst, means being adopted for temperature control by circulation of cooler gases, and for the prevention of carbon deposition on the catalyst.

The immediate application foreseen for this process is in place of oil for the enrichment of blue water gas; since the total gaseous thermal output of a carburetted water gas set on oil is decreased when using methane for enrichment, the CWG set must presumably return to oil operation when meeting peak loads. The economics of the process cannot be decided unless large scale trial is made.

Catalyst Cost

The technical results achieved on the pilot plant may be seen from figures given in the paper mentioned. Operating at a space-velocity of 2000 vol./vol./hr. a final gas of 500 BThU/cu. ft. was made at atmospheric pressure; when operated at 20 atm. the CV was over 700 BThU/cu. ft.; in each case the experiment continued for four months without any appreciable deterioration in the CV. With a catalyst life of this order, the catalyst cost should be no more than 0.3d. a therm.

Electrostatic precipitation of tar fog is now established as a regular part of the by-product recovery system of coke ovens and gas works. The whole gas purification process is becoming more of a chemical engineering job than ever before, partly because of the need to deal properly with the large volume of effluent liquor produced.

K. W. Francombe has discussed electrostatic precipitation of tar in an exceptionally valuable paper and there have been several good papers on the general subject of by-product recovery, gas condensation, etc.

Those who do not operate in the gas industry may be interested to have some indication of modern plant and processes, many of which illustrate that the gas and coke oven industries are becoming branches of chemical engineering.

The gas leaving the retorts is sprayed in modern practice with hot aqueous liquor, thereby replacing its high-temperature sensible heat by the latent heat of steam. The hot gases are then passed through a detarrer to remove the bulk of the higher tar acids (polyhydric phenols) before the aqueous liquor condenses. The last is of the greatest value in producing a reasonably good effluent.

Condenser Design

The gas is cooled in condensers, requiring considerable care in their design to remove the bulk of the water vapour from the gas. The gas passes through an exhauster, and through a second electrostatic tar precipitator (this time on coal gas) to remove the last traces of tar fog that may have condensed, since the gas passed the hot gas precipitator. Ammonia is washed from the gas, either by water, in gas works practice, or by acid, as in general coke oven practice.

Reference must be made to an excellent paper on gas washing, by C. Cooper, who shows that generally, unless the cost of disposal of ammonia liquor is very high, it pays to reduce the size of the washers and to use more water. Benzol recovery (which may come before or after the removal of hydrogen sulphide) involves an oil washing process, and here Cooper has concluded that it is better to use large scrubbers and smaller amounts of oil, because of the cost of steam for distillation.

Attempts are being made to apply fluidisation to the oxide purification process. The liquid purification process now in operation at Manchester gasworks, and developed there by R. Walker and his colleagues, is being built at several gasworks and coke ovens, notably at Liverpool gasworks, which will be the next of these plants to be in operation. Several other attempts are being made to develop flow processes for removal of hydrogen sulphide from town gas.

It has been suggested, however, that what is wrong is not the use of iron oxide for removing hydrogen sulphide from the gas but that the chemical engineering of the oxide process needs modernisation and improvement.

The Gas Research Board (and others) are now working on the extraction of sulphur from spent oxide by solvents, with a view to providing the chemical industry with elementary sulphur in a suitable commercial form.

FUEL INDUSTRIES IN 1949

(*continued from page* 71)

tion thus seems likely to become even more of a chemical engineering process.

The British Sulphate of Ammonia Federation's research department is endeavouring to cheapen the cost of sulphate of ammonia by economy in steam and reduction in maintenance. The use of special metals for construction of saturators and measurement of steam consumption are both yielding some useful rewards. J. Bell (in a paper to the Coke Oven Managers' Association) has described the work of this research organisation. The disposal of coke oven gas, and the method of collaborating with the gas industry as enjoined by the Gas Act, 1948, have been the subject of much anxious thought.

THE SOAP AND OIL INDUSTRIES

Continued Shortage of Animal and Vegetable Fats

WORLD-WIDE shortage of animal and vegetable oils and fats continued to dominate the soap and oleaginous industries in 1949. Strenuous efforts have been made during the year in nearly all contributing countries to increase acreage and acreage yields of oil-bearing crops. That drive has been especially evident in the British Empire, the French overseas territories, India, South America, and the Far East.

Some quick results have been recorded, where they depended upon annual crops, but where the source has been trees or shrubs, taking several years to mature, there has been no marked increase.

World Oilseeds

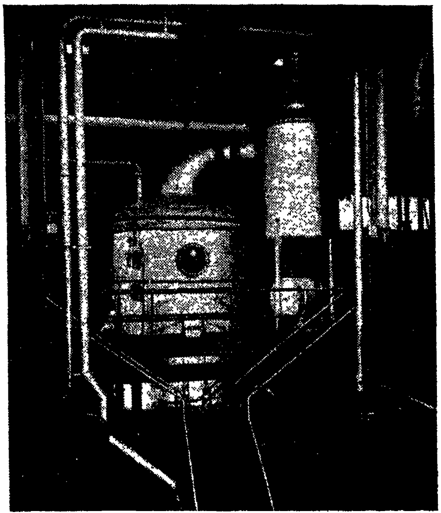
World production of the principal oilseeds and nuts in the war and post-war periods was the subject of a recent review in *Oleagineaux* (1949, 4, 169) with prewar figures for comparison. World yields were estimated to have been:—

	Thousand tons		
	1934-38 average	1947	1948
Groundnuts ...	8,060	9,800	9,900
Colza or rape ...	3,760	4,051	4,300
Copra (including oil)	1,811	1,479	1,241
Cottonseed	13,356	10,740	12,450
Linseed	3,428.5	3,570	4,153
Olive oil	857.2	1,129	1,022
Palm oil (exports) ...	447.35	261	330
Palm kernels	709.2	545	555
Sesame seed	1,393.3	994	1,000
Soya beans	11,842.8	13,350	14,000
Sunflower seed ...	2,309.3	3,471	4,409

These figures are thought to represent about 95 per cent of the world total. Although the totals in several cases exceed those of pre-war years it has to be remembered that there was before the war a substantial shortage, notwithstanding the relatively low level of consumption of fats and soaps in many countries.

Indian Exports

One of the factors contributing to the shortage is the defection of India, formerly an important supplier. Recently India has nearly ceased to be an important exporter of oilseeds; and under the current five-year plan export of oilseeds, especially of groundnuts, is prohibited or discouraged, in favour of the home oil-milling, soap, and other industries to be developed. Of all the major oilseeds it is intended that much larger areas shall be cultivated and yields per acre increased. Equally vigorous efforts are being made to increase supplies from the French overseas territories and in other countries.



[Courtesy, Bamag Ltd.]

10-ton deodorising plant

In his informative annual survey of the oils and fats position, the chairman of Lever Bros., Ltd., Sir Geoffrey Heyworth, stressed the importance of a proper valuation of stocks and fixed assets under present conditions, and gave rather more conservative figures for world production than are shown in the above table. The shortage of at least 4 million tons which prevailed in 1947 still persists and has probably been increased, bearing in mind that world population has increased by about 8 per cent.

A complication of the world position has been the existence of two price levels and two markets, one of dollar countries and the other non-dollar. So far as Europe was concerned, the Marshall Plan ensured exports of oils and fats to Europe between April 1948 and May 1949 to the value of $250 million. Much of this went to W. Germany which was enabled to increase its margarine output to 250,000 tons in 1949 (120,000 tons in 1948.) The great problem continues to be the removal of restrictions and artificial price levels and the return to one world market for oils and fats.

Another comprehensive survey was that of Mr. P. H. Faure, secretary of the International Association of Seed Crushers (*Oléag.*, 1949, *4*, 567-570).

Total world exports of oils and fats were nearly 8 million tons in 1948, more than two-thirds of which came to Europe.[1] Total world exports this year were estimated at about 300,000 tons larger, and in 1950 there may be another increase of 270,000 tons.

Despite the enormous production of soya beans, still the main crop in Manchuria and now one of the main crops in the U.S.A., little becomes available for export. Mr. Faure has urged that production must be vigorously increased in the weak exchange (non-dollar) countries and foresees that the great increase in manufacture of synthetic detergents may ease the position a little.

The Indian policy favouring export of oils rather than oilseeds, to develop the home oilmilling industry, may well be extended later to include soap, margarine, and other fatty oil industries, so that even vegetable oil exports may be limited. Already it is proposed to raise Indian soap production to 800,000 tons a year.

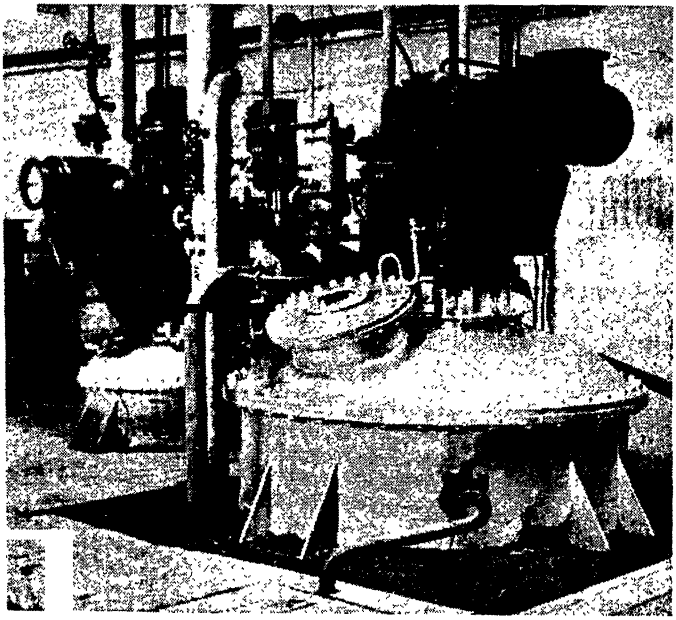
No outstanding advance has been made in oil expressing and solvent extracting during the year. Much has been written of the achievements of the past few years, in which American and Continental engineering firms have perhaps secured more publicity than the British makers.

One of the greatest drawbacks to the Indian development plan is stated to be inability to secure sufficient machinery and plant, especially for oil-milling and soap manufacture. An interesting and fairly comprehensive account of the oil-milling industry, with particular reference to American and French machinery, was given by Y. Bagot, at a conference in Marseilles in 1948, and in the previous year at the Centre de Perfectionnement.[2]

Bagot compares modern expression methods, *e.g.*, the continuous process, with solvent extraction. To a certain extent rivals, they are in other respects complementary. It is now common practice to combine the processes, first expressing and then recovering the balance of the oil (or most of it) from the cake by solvent extraction.

Many papers have been read and patents issued, mostly in connection with solvent extraction, and solvent recovery. Interest has attached to the Japanese work on alcohol extraction of soya bean[3] and to solvent extraction of crude lipid from oilseeds.[4]

A great deal of material has been published on oxidation, polymerisation, etc. Eckey and Formo,[5] on inter-esterification, reported on a directed method in which ester interchange is effected in



Indicative of the size which modern processing plant has reached are these two working heads of (right) a hydrogenation autoclave and (left) a catalyst reducer. Both these installations occupy the whole depth of the floor below

[Courtesy, Bamag Ltd.]

triglyceride mixtures with simultaneous crystallisation of solid glycerides. The mixtures contained free hydroxyl groups. The principal governing variables are indicated. It was possible to segregate high and low melting fatty acids into separate ester fractions.

Variation of chemical reaction with temperature during oxidation and polymerisation of fatty oils was investigated by Gillam[6] continuing earlier work. Published data on oxidation products of unsaturated fatty oils were reviewed in some detail, with a classification in four groups.

Autoxydation of linoleates formed the subject of a publication of the Hormel Institute, Minnesota, by W. O. Lundberg.[7] One of the objects of this study of reaction mechanisms was to determine the kind of anti-oxidant required in food preservation wherein fatty oxidation is to be expected. Phenolic anti-oxidants appeared to be relatively ineffective.

At the IRHO in Paris, Loury and Mellier[8] studied the evolution of peroxides during autoxidation of fats. When the fat is heated to about 80° C. the peroxide index undergoes considerable variation, irrespective of the oxygen absorbed, so there may be two forms of peroxide in the autoidised fat: one thermolabile and the other thermostabile. Lea's index does not allow such distinction.

Retarding Oxidation

In connection with elaidinised fats, Bertram[9] investigated their keeping qualities by rate of peroxide formation. The causes are both chemical and physical. Traces of Se have been found to have strong anti-oxidising action, especially if traces of metal are eliminated. Elaido-configuration of unsaturated acids was, however, the principal factor in retarding oxidation. The polarograph has been used to distinguish peroxide structures in oxidised fats. Lewis *et al.* found at least three different forms present in the early stages.

Among the numerous applications of ultrasonics must be included the emulsification of fatty oils, the technique of which has been described by Anouin and Levasseur,[10] using the SCAM projector. Frequency played a predominating part—within the range used by the authors, namely 187 KHz to 6 MHz.; and the progressive are much more interesting than the stationary waves. Some research on the effect of using pairs of emulsifying agents was undertaken by Jellinek and Anson.[11] Different types of emulsions are thus promoted, and complexes formed at the interface, reducing interfacial tension more than either of the agents do alone. The capillary height method was used for measuring the interfacial tension of liquid paraffin and water at 70° C.

In the important field of hydrogenation Russian work has been published on hardening seal fat (Caspian Sea) and on polarographic determination of Ni and Cu in hardened fat.[13] Those pioneers in fat-hardening, the De No Fa Co. (with C. F. Holmboe) have patented further improvements in English Patent 620,043, 620,145, and 619,961. Greater speed and more heat economy are claimed in EP 621,037 by d'Astecky Callery. The Lever Bros. Co., of the U.S.A., in U.S.P. 2,468,709 describe the use of a new catalyst with a relatively large content of sulphur.

Adsorbent Activity

Research on adsorption and other methods was continued by, among others, Stout.[14] From the point of view of adsorbent activity, acid-activated clays are generally 1½ times more effective than natural earths, at the optimum temperature of about 100-106° C. for the clays and 118-132° C. for the earths, except with high Si earths, when optimum temperature is 180-250° C.

An interesting account of the use of sodium chlorite for bleaching, largely employed in the U.S.A., was given by Mouton and Borezee.[15] There are several variations: with the chlorite alone, activated with acids, salts, persalts, hypochlorites, direct with chlorine dioxide, and with various modifiers (reducers, etc.). The Mathieson Alkali Works, which has lately taken out many patents for ClO_2, is among the American leaders in this field. This work includes, of course, the use of effective oxidation inhibitors, such as wheat germ oil, oat extracts, etc., and it covers both vegetable and animal oils as well as soaps.

American Methods

The American Oil Chemists' Society has published during the year a number of reports on methods and several articles of value, such as: determination of free glycerol in soaps, by Pohle *et al.* (376-8); determination of K in soaps and mixed caustic lye, by Miller and Andrews (309-312); estimation of peroxides in oils and fats by ferric thiocyanate method, by Chapman and Mackay (360-3).

The last method is very sensitive to the presence of air, and minimal results are possible only in purified N with total exclusion of air. For comparative tests this precaution is less necessary. The meeting of the International Committee on Oils and Fats[16] dealt with methods of sampling and analysis for water and oil in oilseeds; also alkalis and rosin in soap; soluble and insoluble volatile acids and sterols; and determination of thiocyanogen and peroxide numbers in oils and fats.

Iodine value is generally observed to fall during oxidation or polymerisation. Actually this is the net result of a number of reactions, some of which tend to lower i.v. by reacting at the double bond; others tend to raise it. These reactions, which may occur either independently or in chemical sequent, have been briefly reviewed by Gillam.[17]

Oxidation with Neutral Oil

In connection with the formation of oxidised acid in soap-stock, some observed anomalies in the usual method have been noted and discussed by Quelet *et al.*[18] It was found that oxidation proceeds much more rapidly with neutral oil and fatty acids than with soaps. Mucilaginous matter and NaOH in excess have no effect, but various salts are accelerators. Na soaps prepared with ground nut oil previously oxidised to peroxide number above 125 cannot be grained out, but form a jelly which retains all added salt.

In an analytical study of the soap-boiling process, J. Holmberg[19] determined the component fatty acids of soaps from various stages of soap-boiling, in order to study fractionation of individual soaps when the soap mass in the kettle forms separate liquid layers, one of which is of liquid crystal structure. Fractionation occurs both on graining and fitting. Acids up to C_{16} are enriched in lye and nigre. Acids from C_{18} upwards are enriched in the neat.

In analysis, volatile acids are first separated by steam and fractional distillations. The sapon. val. and i.v. were found for each fraction. Non-volatile acids were pre-fractionated by low temperature fractional crystallisation from ether and acetone. Analytical data have been tabulated, including component acids of soaps in various stages.

The first of a series of studies of soap solutions by Stainsby and Alexander[20] dealt with fatty acid soaps and their hydrolysis in aqueous solutions. Hydrolysis is discussed on the assumption that mixed micelle formation occurs between fatty acid moles—formed by hydrolysis—and soap ions. The main features of hydrolysis curves of Powney and Jordan from *pH* measurements are quantitatively established.

The way in which soap or soap solutions act, or the general problems of detergency, have continued to stimulate much interesting research, especially in the context of surface active agents and the like.

There has been a constant flow of papers and patents on surface active agents, in which the leading Swiss chemical firms occupy an important position, especially in connection with textile preparations. The comprehensive volume on the subject by Schwarz and Perry[22] is one of the more important contributions during the past year.

Some interesting sea-water detergency experiments by the U.S. Army have been recounted by T. H. Vaughn *et al.*[23] 160 products were tested and the effects of concentration, pH, temperatures were studied for four of the most promising: Na salt of f.a. sulphonated amide, poly-alkyl ether condensate of fat acids, and alkyl aryl poly-ether alcohol, and poly-ethylene oxide derivative of sorbital mono-oleate. Optimum concentration was 0.5 per cent and temperature 120-140° F. All four appeared to give equally good results in large-scale laundry tests with sea-water.

Trinidad Oil

Following other oil companies, Trinidad Leaseholds, Ltd. is collaborating with Universal Oil Products, of Chicago, in manufacturing chemicals and other products from Trinidad oil, including a hydrocarbon oil which can be converted into a soapless detergent.[24] Favourable contracts are said to have been made with soap-makers. A large number of patents, English and American, have been published, many of them, as would be expected, dealing with the alkyl aryl compounds in some form or other.

REFERENCES

[1] P. H. Faure (Internat. Assn. of Seed Crushers), *Oléag*, 1949, 4, 567-570.
[2] *Oléag*, 1949, 4, 339-345 and 427-433.
[3] *Chem. Abs.*, 1949, 5209.
[4] Wingard and Shand, *Jnl. Am. Oil Chem. Soc.*, 1949, 422-6.
[5] *Jnl. Am. Oil Chem. Soc.*, 1949, *26*, 207-11.
[6] *Austral. Chem. Inst. Jnl.*, 1949, *16*, 19-36.
[7] *Oléag*, 1949, 4, 85-93 (in English).
[8] *Oléag*, 1949, 4, 665-8.
[9] *Jnl. Am. Oil. Chem. Soc.*, 26, 83-5.
[10] *Oléag*, 1949, 4, 95-100.
[11] *Jnl. SCI.*, 1949, *68*, 108-114.
[12] *Priklad. Khim.*, 1948, *21*, 164-170.
[13] *Zarods. Lab.*, 1948, *14*, 498-9.
[14] *Jnl. Am. Oil Chem. Soc.*, 1949, 120-6.
[15] *Oléag*, 1949, 4, 271-80.
[16] *Jnl. Am. Oil Chem. Soc.*, 1949, *26*, 106-9.
[17] *Austral. Chem. Jnl.*, 1948, *15*, 126-134.
[18] *Bull. mens. ITERG*, 1949, *3*, 73-7.
[19] *Svensk. Kem. Tid.*, 1949, *60* (48), 267-281.
[20] *Trans. Far. Soc.*, 1949, *45*, 585-97.
[21] *SPC*, 1949, 22, 150-3, 483-6.
[22] Interscience Pub., New York, 1949.
[23] *Ind. Eng. Chem.*, 1949, *41*, 112-19.
[24] *Chem. Trade Jnl.*, 1949, November 18.

POWDER METALLURGY PROGRESS

Titanium a Possible Successor to Aluminium

by R. A. HETZIG

IN the absence of official statistics, it is impossible to indicate any trends in the manufacture and consumption of metal powders from one year to the other. The position is different only in the United States, where the Metal Powder Association publishes figures, confidential to its members, of the quantities of powders used monthly for specific purposes, but no such data are available from any other major industrial country.

In fact, although the powder metallurgy industry in Great Britain, Sweden and France is by no means negligible, a careful scrutiny of the year's literature reveals only three significant figures. The first is that Ford turns out in America 1 million sintered bushings per month[1], the second Chrysler and General Motors between them manufacture some 70 parts for their current automobile production[2], and the third that the Lionel Corporation in the States produces tens of millions of sintered iron top locomotive wheels annually[3].

As these figures are obviously inadequate for estimating the economic significance of the powder metallurgy technique, the only other approach is to balance the encouraging and critical expressions of opinion contained in various authoritative general articles.

Sintered Alloy Steels

Greenwood[4] has summarised the developments that are taking place in the manufacture of small parts from sintered alloy steels. Components mass-produced in this country to-day include rifle magazine catches, hub gears for pedal cycles, pawls, chain bushes, ball-bearing races and die shoes for tangential die heads. Sintered nickel-manganese steels are mentioned in particular, and it is understood that considerable use is made also of surface treatment processes such as cyaniding, chromium-plating, etc.

Bonanno[3], the design engineer of the Lionel Corporation, was especially insistent upon the potential advantages of price between sintered and cast parts, there being practically no scrap losses involved with the former. He also pointed out that the development of a large flake iron powder would help powder metallurgy to enter the field of manufacturing laminated cores for electrical and electronic applications. In his estimation, the market in the United States for such products was of the order of 100,000 tons per annum.

It is, therefore, an interesting coincidence that at this year's Exhibition of the Physical Society a large industrial concern in this country[5] exhibited various E- and L-pieces made from flake iron powder. The manufacturing process has in the meantime also been patented[5].

Warnings

A note of caution, on the other hand, has been voiced by Clauser[6], whose opinion was supported also by an editorial[7] which stated that "like other new processes, powder metallurgy has sometimes been oversold." Clauser[8] later also published an article on "Structural Parts from Metal Powders," which forms a very sound survey of the manufacturing problems involved.

Ziegfeld and Roll[9], of the Metal Powder Association, New York, warned against indiscriminate application of powder metallurgy, though they certainly also made out a very good case for powder metallurgy where it is really applicable. Perhaps the most objective review of the entire powder metallurgy technique was written by Michel[10], who treated the subject with characteristically French clarity.

In addition to Clauser[8], two other informative articles on the manufacture and design of sintered parts were forthcoming from Engstrand, Gleszer and Polonetz[11], and from Toeplitz[12]. The latter, in particular, dealt with the tolerances of finished metal powder parts.

Carbide cutting tools have attained to such a high degree of perfection that major developments in this field can no longer be expected. Sandford[13] has described the various manufacturing procedures for making tool tips with specified properties, a subject covered only slightly less comprehensively by "Materials and Methods" Manual No. 46[14]. The performance of carbide cutting tools was treated thoroughly in a paper by Eatough and Eckersley[15], and also by Shute[16] in a small brochure on "Cemented Carbide Tools."

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* Powder Metallurgy, Ltd.

The question of particle size measurement of tungsten carbide powder received attention from Burden and Barker[17], who correlated the surface mean diameter of either the original tungsten powder or the tungsten carbide-cobalt powder with the hardness of the finished sintered carbide. They consequently use this method for quality control. Work on the sintering mechanism of hard carbide compositions has been ably summarised by Kieffer[18].

Sintered Wire Advantages

Advances in high-temperature furnace techniques no longer make it essential to treat platinum only by the powder metallurgy method. One important war-time use of this metal was as sparking plug electrodes for aero-engines, and since significant discrepancies appeared in the behaviour of wire made either from cast or from sintered platinum, the problem was investigated by Middleton, Pfeil and Rhodes[19], who found that the porosity in sintered wire was instrumental in maintaining the fibrous structure well above the re-crystallisation temperature of the cast wire. In this particular case, therefore, sintered platinum was obviously to be preferred to the cast metal.

Tungsten filaments for electric lamp manufacture are still, after 40 years, one of the most important applications of the metal. Apart from the BIOS reports on German industry which have appeared in recent years, the subject has been lying dormant for quite a long while. The manufacture of tungsten filaments, in fact, is still one of the most carefully guarded industrial secrets, but in the period under review Smeaton[20] described quite fully the manufacture of tungsten powder from scheelite in a one ton per week plant, omitting only details of the doping of the oxide prior to its reduction to the metal.

Titanium's Future

Newcomers to the metals field are few and far between, but titanium has recently been put forward as a possible successor to aluminium, which acquired the status of a major industry within the last two or three generations. American sources, in particular, have not hesitated to give glowing accounts of its possibilities[21], and the position appears to be that titanium could compete with stainless steel in many applications, though by no means in all[22]. This would ensure for it a reasonably wide and stable market, with concomitant savings in the consumption of chromium and nickel.

Another potentially important outlet for titanium alloys may be as a structural material in aircraft production, since it has a favourable strength/weight ratio with a density intermediate between that of the light metals and steel or copper. Its machining and work-hardening properties are good, but it is extremely sensitive to oxygen and nitrogen, which reduces its ductility and resistance to corrosion.

Titanium can be produced by the iodide process, in which the tetra-iodide is decomposed on a hot filament, or by the Kroll process in which titanium tetrachloride is reduced with magnesium in the vapour phase. The powder may be melted in graphite crucibles and cast, or it may be pressed and hot-rolled in sealed steel containers from which it can be easily removed, any traces of iron in the surface being removed by pickling.

This process of sheath-rolling[23] seems to be the correct method of working titanium powder, because rolled titanium is less porous and less embrittled through the presence of oxygen and nitrogen than compacts that are pressed and sintered in the ordinary way.

Problems to be Solved

A great deal of useful information on cast or sintered Ti metal and alloys may be found in a series of 17 papers that were presented at a Symposium on Titanium[24], sponsored by the U.S. Office of Naval Research in December, 1948. Titanium undoubtedly has a future, but many difficulties remain to be overcome before it can fulfil all the promising expectations that have been raised on its behalf.

Some details of an interesting new device were given in this journal recently[25]. Briefly, the idea is to get a uniform suspension of carbonyl iron powder in a suitable oil, expose it to a magnetic field, and obtain a congealed mass of metal powder that can exert a frictional effect upon the rotating base plates. The magnitude of the frictional effect varies with the strength of the magnetic field, and the practically immediate response obtainable makes the clutch eminently suitable for Servo mechanisms.

The clutch was developed originally for use in an "electronic brain," but it obviously has possibilities in many other directions. The General Electric Co. in America[26] has made experimental clutches with torques ranging from 0.2 in./lb. for tension devices up to 160 in./lb. for testing aircraft engines, although they have apparently dispensed with the oil suspension in favour of graphite-coated carbonyl iron powder. Several Government agencies and industrial concerns are working on the problem, and one firm[27] has recently put on the market a series of different types of magnetic fluid clutch.

Dust cores have been in use for a good many years now. Their design comes into the province of electrical engineering rather than into that of powder metallurgy, and even their manufacture has recently been claimed by electrical engineers[28] to resemble rather the moulding of plastics than powder metallurgy. However this may be, the fact remains that a whole series of powdered magnetic metals and alloys is listed in the paper just mentioned as core materials for different purposes.

It is necessary to reduce eddy current losses to a minimum in order to obtain the necessary induction efficiencies. While one method is to insulate each magnetic particle with a plastic or ceramic coating, another method would be to take a ceramic material having magnetic properties and obtain low eddy current losses through the high electrical resistance of the material itself.

Properties of Ferrites

Research on these lines was begun by Philips, Eindhoven, in 1933, who found that certain mixed ferrites possessed the required properties. Manganese-zinc ferrite and nickel-zinc ferrite have so far proved to have the most interesting properties, presumably because their molecular structures are so arranged that they form two concentric cubes.

Polder[29], of Eindhoven, recently gave an excellent paper on the theory of ferrites, indicating also reasons for the incompatibility of certain magnetic properties. For instance, it is not possible to obtain simultaneously a high initial permeability and a high frequency-limit. This paper was followed by one by Latimer and MacDonald[30], of Mullard Electronic Products, Ltd., who dealt comprehensively with the application side. These authors also demonstrated the manufacture of Ferroxcube parts, as these materials are called, by means of a film.

Ferroxcube cores have a definite sphere of utility in which they can compete with dust cores, and though they are not a powder metallurgy product, they represent a most interesting border-line case between ceramics and powder metallurgy of which more will undoubtedly be heard.

Another field in which a combination of powder metallurgy and ceramics may have fruitful results is the manufacture of gas turbine blades. Here the object is to obtain minimum creep and minimum oxidation at operating temperatures which are now in the neighbourhood of 1200°C. to 1500°C.

The metallurgist has produced gas turbine blades from special alloys that meet these exacting conditions by using the lost wax process (precision investment casting) or the various machining methods. A considerable amount of work, however, is being done, especially in America, to obtain the same results by pressing and sintering mixtures of metal powders and refractory oxides or carbides, *e.g.*, titanium carbide. All this work is still in the experimental stage. Theoretically these compound materials should have a fairly ideal combined resistance to thermal shock, creep and oxidation.

Cermet Tests

Bobrowsky[31] has collated all published data on the physical properties of ceramals or cermets, as these combinations are variously called, but so far only one report has given any results of operating tests. Hoffman, Ault and Gangler[31] obtained a qualified success with 80/20 titanium carbide-cobalt blades in an experimental gas turbine.

The field of radioactive isotopes in metallurgy is still relatively uncharted, though it may be assumed that much experience with the tracer technique has accumulated during the last few years. An informative article on the subject has been published by Birchenall and Philbrook[32], who mention powder metallurgy incidentally in connection with the measurement of self-diffusion coefficients.

Radioactive Applications

The powder metallurgy method may become extremely valuable in the application of radioactive materials. The United States Radium Corporation has recently filed a patent[33] claiming mixtures of metal powders with radioactive substances for the purpose of obtaining uniform distribution of the latter. Radium needles made of " radioactive stainless steel " are mentioned, as well as a whole series of other possible applications ranging from radioactive sparking plugs and fuses to the sterilisation of milk and telecommunications equipment. This specification contains, in fact, a brief summary of the peace-time uses of atomic energy, apart from its reference to powder metallurgy.

Volume I of a three-volume " Treatise

on Powder Metallurgy" by Goetzel[34] has appeared during the year. It has been favourably reviewed in the technical Press and represents a very sound and up-to-date account of the practical aspects of powder metallurgy. The theories of pressing and sintering are outlined in this first volume, and are to be dealt with more fully in Volume II.

Several interesting papers appeared in the February, 1949, issue of the *Journal of Metals, viz.*, Duwez and Zwell[35] on pressure distribution during the compacting of powders, Kuczynski[36] on the sintering of spherical powder particles to a flat base of the same metal, and Jordan and Duwez[37] on the densification of copper powder compacts sintered in hydrogen and in vacuum.

Recently Shank and Wulff[38] published same work on the distribution of stresses in the die material that occur during the compaction of powder, and emphasised the importance of eliminating elastic deformation of the die which may be the main cause of laminar cracks in pressings.

A three-day symposium on the physics of powder metallurgy was held by the Sylvania Electric Products, Inc., last August. The 23 papers that were presented have been excellently reviewed by Lenel[39].

REFERENCES

[1] *Iron Age*, 1949, *163* (12), 76-80.
[2] *Ibid.*, 86-89.
[3] Proc. Fifth Ann. Meeting, Metal Powder Association, 1949, 74-92; *Machine Design*, 1949, *21* (5), 133-136, 180, 182, 184.
[4] *Iron and Steel*, 1949, 22, 9-10.
[5] The Plessey Co., Ltd., Brit. Pat. 625,627.
[6] *Materials and Methods*, 1949 *29* (3), 45-48.
[7] *Ibid.*, 43.
[8] *Materials and Methods*, Manual No. 52.
[9] *Iron Age*, 1949, *163* (12), 68-71.
[10] *La Documentation Métallurgique*, 1949 (1), 3-13.
[11] *Product Eng.*, 1949, *20* (7), 123-127.
[12] Proc. Fifth Ann. Meeting, Metal Powder Association, 1949, 36-50.
[13] *Alloy Metals Rev.*, 1949, 7 (52), 2-12.
[14] *Materials and Methods*, 1949, *29* (2), 73-84.
[15] *J. Inst. Prod. Eng.*, 1949, *28*, 394-422.
[16] *Machinery's Yellow Back Series*, No. 6.
[17] *J. Inst. Metals*, 1948, *75*, 51-68.
[18] Sylvania Electric Products Inc., "Symposium on the Physics of Powder Metallurgy," August, 1949.
[19] *J. Inst. Metals*, 1949, *75*, 595-608.
[20] Institution of Mining and Metallurgy, "Symposium on the Refining of Non-Ferrous Metals," Paper No. 18, July, 1949.
[21] *Materials and Methods*, 1949, *27* (1), 75-78; *Ind. Eng. Chem.*, 1948, *40* (10), 99A-100A; *Min. and Met.*, 1948, *29*, 615-617; *J. Metals*, 1949, *1* (1), 6-9 (Sect. 1) *J. Amer. Soc. Naval Eng.*, 1948, *60*, 443-460; Ind. Bull. of Arthur D. Little Inc., 1949 (252), 3-4.; *J. Electrochem. Soc.*, 1949, *96* (1), 19*C*-21*C*; *Iron Age*, 1949, *164* (4), 48-51.
[22] *Product Eng.*, 1949, *20* (11), 130-152.
[23] *Metal Progress*, 1949, *55*, 191-192.
[24] *Ibid.*, 185-200, 345-368.
[25] *Chemical Age*, 1949, *61*, 317.
[26] Proc. Fifth Ann. Meeting, Metal Powder Association, 1949, 93-106.
[27] *Machine Design*, 1949, *21* (11), 152.
[28] C. E. Richards S. E. Buckley, P. R. Bardell and A. C. Lynch: "Some Properties and Tests of Magnetic Powders and Powder Cores," Institution of Elctrical Engineers, November, 1949.
[29] D. Polder: "Ferrite Materials," Institution of Electrical Engineers, November, 1949.
[30] K. E. Latimer and H. B. MacDonald: "A Survey of the Possible Applications of Ferrites," Institution of Electrical Engineers, November, 1949.
[31] Trans. A.S.M.E., 1949, *71*, 621-629.
[32] *Iron Age*, 1949, *164* (19), 77-82, 174.
[33] Brit. Pat. 629,415.
[34] The Macmillan Co., New York and London.
[35] *J. Metals*, 1949, *1*, 137-144.
[36] *Ibid.*, 169-178.
[37] *Ibid.*, 96-99.
[38] *Ibid.*, 561-570.
[39] *Metal Progress*, 1949, *56*, 515, 570-580 (even pages only).

Semi-Conducting Materials

RESEARCH workers from Great Britain, the United States, Czechoslovakia, France, the Netherlands, Sweden and Switzerland will contribute papers to a conference on the properties of semi-conducting materials to be held at the University of Reading from July 10-15.

The conference, which is assisted by the United Nations Educational, Scientific and Cultural Organisation, will be under the auspices of the International Union of Physics, in co-operation with the Royal Society.

Prof. N. F. Mott and Prof. R. W. Ditchburn will be organisers and subjects for discussion will include the conductive properties of non-metallic solids, photo-conduction, barrier-layer rectifiers, crystal triodes and the relevant theoretical issues.

The Year's Steel

OVER 2 million tons of steel ingots and 1,135,551 tons of pig-iron and ferro alloys were produced in 1949 by the United Steel Companies, Ltd. These figures and those released by the main steel making firms, suggest that the industry's higher target—15.5 million tons—has been passed.

Producers have now asked the Government to scrap its compulsory distribution scheme, on the grounds that it is out of date and no longer necessary.

The opinion of the Economic Commission for Europe—that the world may have an economic surplus of steel by 1953—is not shared by the Government, which has agreed to the industry's plan to produce 18 million tons by that date. It has been estimated that about 14.5 million tons of this will be required for use in the United Kingdom.

ELECTROPLATING AND ELECTROPOLISHING

Some Details of the Year's Research

AMONG those contributing to the theory of electro-deposition and electro-chemical phenomena generally in recent years, Prof. Piontelli, of Milan University, occupies a high position. Although much of the work herein briefly noted is prior to 1949, an English version of some of it has just been published (*Metallurgia,* 1949, *41,* 22-25, November). It comprises the general electro-chemical behaviour of metals, electro-deposition of alloys, auto-displacement of lead, and, more specifically, classification of metals according to electro-motive properties, relation between inertia and anodic passivity, and action in concentration cells.

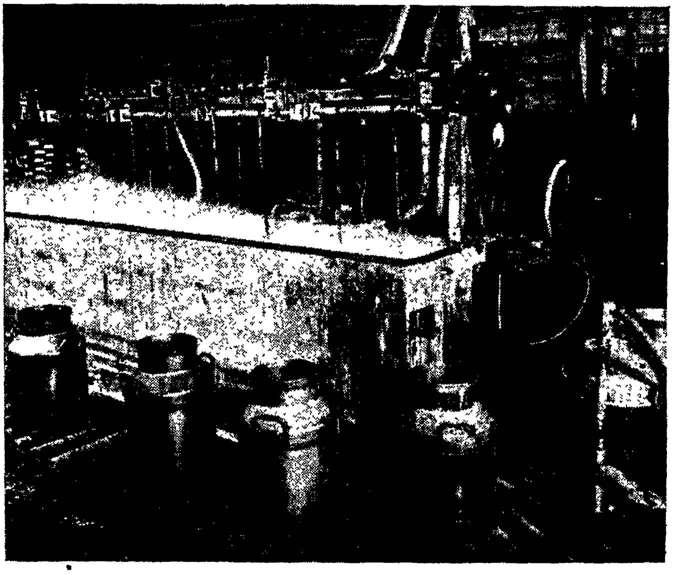
The treatment of electro-deposition of alloys is mathematical and, in places, a little obscure. Part of this subject was dealt with in the paper by Piontelli at the 3rd International Electro-deposition Conference, in London. As the author says, without adequate theoretical basis the study of many complex phenomena of electro-deposition is liable to shipwreck on the rocks of empiricism.

It is, however, difficult to say how substantial are the contributions made to theory this year. Study of the *Trans. Far. Soc.* reveals wide and varied research over a vast field, but not much of direct interest in the present theme.

Hoar's paper on breakdown and repair of oxide films on iron should be mentioned (*ibid.*, 45, 683-693). It is, in any case, an important addition to corrosion theory. The mechanism of this breakdown and repair is examined with special reference to the influence of film rupturing anions (chloride and perchlorate) and repair anions (carbonate, nitrite, and chromate) on the behaviour of iron. Reasons are given for believing that the pores in the oxide films that are potential points of corrosion are easily penetrated by all common anions.

Although the Electrochemical Society, U.S.A., has been largely pre-occupied during the year with the preparation and properties of phosphors (for luminescence, etc.), several papers of interest, theoretical and practical, in the electroplating and kindred sections have been published. A good example is that by Wadsley and Walkley on MnO_2 potential (*Jnl. E.S.*, 1949, *95*, 11-20).

(*continued overleaf*)



Plant at the Tin Research Institute, Greenford, Middlesex, used for the electrolytic degreasing of steel milk cans prior to pickling and tinning

[Courtesy of Clare's Services

The potential of the system, Pt or C, $MnO_2/MnCl_2$, HCl, AgCl/Ag, was determined to obtain standard potential of the MnO_2-manganous ion couple in acid solution. Attempts are made to explain, on the basis of the experiments, conflicting evidence of previous workers.

Other papers are: the electro-deposition behaviour of simple ions, and application of the Nernst equations (*ibid.*, 25-32); rate of solution of highest purity Al in NaOH solutions (*ibid.*, 98-106).

Natural Convections

A paper by Wagner deals with the rôle of natural convections in electrolytic processes. At a vertical electrode, well defined convective flow, due to generally smaller density in the boundary layer and resulting buoyancy force, exists. It is analogous to natural convection in heat transfer from radiators. The interplay between diffusion and convective flow determines the limiting c.d. (current density) when such voltage is applied that concentration of one of the reactants at electrode drops to zero.

In Germany, H. Lux has continued his researches on reactions in melts, namely: 4. equilibrium system—alkali oxide/*m*-phosphate/*o*-phosphate; 5. solubility of CaO; and 6. equilibrium in system—Na_2O-TiO_2. (*Zt. f. Elektrochem.*, 1949, *53* (1), 41-48) Schwabe has reported on the use of the bismuth electrode (*ibid.*, 125-132). Bismuth electrodes prepared in various ways for use in *p*H measurements were compared with the usual type, and gave results in good agreement. They offered certain advantages in the alkali range.

Some work has been done by Raub *et al.* on the electrolytic separation of Ag from K and Na silver cyanide solutions, also those containing $CuSO_4$ or $AgNO_3$ to which organic oxyacids and the like have been added.

In Russia, some experimental work by Z. A. Iofa *et al.* has recently been published (*Zhurn. Priklad. Khim.*, 1949, *22* (9), 983-994), dealing with reactions occurring at the zinc electrode of an alkaline (electrolyte) cell. It was carried out in the electrochemical department of the Moscow University, and included a study of equilibrium in the system ZnO—KOH—H_2O and the changes in structure and properties of the deposits, ageing, passivation and its effects, together with the relation between potential and c.d. during passivation and activation (depassivation) of the zinc anode in caustic potash solution.

It was shown that the loose friable deposits easily removed from the electrode do not inhibit anodic solution, and that there is some relation between the changing form of deposit separating out in the electrolyte and the structure of the electrode deposit.

In every case, whenever the rhombic hydroxide is precipitated or deposited, the zinc electrode invariably becomes passive at the beginning of the secondary working period of the cell, and the cell ceases to function. This rhombic form is stable in strong caustic potash solutions at low temperatures, and in medium strength solutions at room temperature. At the latter, with strong solutions, the stable and in equilibrium zinc oxide appears without formation of dense films or flake impermeable to the current, so that the cell can function without passivation during its secondary stage.

Moreover, the cell can work uninterruptedly in that stage in medium concentrations only at temperatures of zero or below, since, in these conditions, there is primarily a deposition of prismatic and acicular forms of hydroxide which do not produce an adhesive film.

Corrosion research at the Department of Scientific and Industrial Research laboratories described during open days (June 28-July 1, 1949), is of wide general interest. Probably the most interesting from the electroplating point of view was the demonstration of chromatographic analysis, which has been successfully developed. Separations are carried out with organic solvents and solid adsorbents, *e.g.*, cellulose in the form of strips or sheets of adsorbent paper or as pulp packed in tubes. In this connection reference should be made to the general discussion on chromatographic analysis by the Faraday Society on September 22-24.

Passivity

Unified mechanism of passivation and inhibition was described by R. B. Mears, of the Research Laboratory, Carnegie-Illinois Corporation (*Jnl. Electro-chem. Soc.*, 1949, *95*, 1-10). Such mechanism is based on the behaviour of local elements in the metal surfaces. It is suggested that passivity may be attained by (a) reduction of open circuit potential differences between local anodes and cathodes; (b) increased anodic polarisation; (c) increased cathodic polarisation; or (d) combinations of these.

Electrophoresis is described by A. H. Stuart (*Electroplat.*, 1949, 513-8), using colloidal solutions and emulsions.

The Electrodepositors' Technical Society continues to provide a wealth of practical material in its journal. It was revealed that the very successful 3rd International Organisation had cost the society £381, and this by no means extravagant figure was rightly regarded as a long-term investment.* The comparatively new journal *Electroplating*, in its enlarged form, is further extending its sphere of usefulness; the present review is much indebted to it. (References hereafter under *El.*).

In the U.S.A. also the industry has continued its growth. That is evidenced by figures of large increases in power requirements, published in *J. Electrochem. Soc.* Between 1929 and 1943 the power used in what are called the natural electro process industries increased from 9 to 38 billion kWh, and use by electric furnace alloys in 1943 was 5.25 billion.

The American journal *Plating* in 1949 also contained much of practical interest, including a long series of articles on the determination of impurities in electroplating solutions, and another on porosity of coatings. Other articles dealt with the chemistry of the CuZn alloy plating baths, and electrolytic tin-plating.

The estimation of Co in bright Ni plating solutions, applying the method of Dickens and Massen for estimation of Co in steel, is described by Carter (*J. Electrodep. Tech. Soc.*, 1949, *24*, 27-31). A strongly ammoniacal solution of a Co salt is titrated with K ferricyanide, and the end point potentiometrically determined. The EFCO-Udylite bright nickel solution, produced by the Electrochemical Engineering Co., Weybridge, offers many advantages, using an organic brightener, and having a throwing power said to be equal to that of other bright nickel agents (*El.*, 1949, *2*, 92-4).

Black Nickel Plating

Defects and their remedies in black nickel plating solutions are discussed (*ibid.*, 249-252); and what is modestly claimed to be a simple exposition of nickel plating for the less advanced reader is given by R. L. Buckley (*ibid.*, July). The Mond Nickel Co., Ltd., has several patents for nickel plating: deposition on Zn, EP 615,036; Ni on Ni, EP 617,689, 618,322; anode assembly for Ni plating EP 613,244. The Harshaw Chemical Co. has EP 622,761, for bright and semi-bright Ni plating.

Electroplating data sheet No. 1 (*El.*, 1949, *3*, 9-13) provides a comprehensive list of addition agents for zinc plating solutions, mostly brighteners. The first publication of the Hot Dip Galvanising Association, affiliated to the Zinc Development Association, relates generally to hot dip galvanising and rust prevention. Among patents are EP 614,847, of E. I. Du Pont de Nemours, for new foaming galvanising fluxes; and U.S.P. 2,479,670 (Chester). for deposition of Zn. The converse process, that of plating zinc itself, is described, with special reference to the Despo method for zinc and zinc alloys (*El.* 1949, *3*, 54-56). The chemistry of CuZn alloy plating baths has already been noted.

Tin Reducing Plant

It is claimed that the electrolytic tin-plating plant of the Republic Steel Corporation, U.S.A., which has taken the place of the hot dip pots, has considerably reduced the amount of tin required per unit area, effecting a saving of 0.5 to 1.5 lb. per 217 sq. ft. As the new plant has a working speed of 500 ft./min., this could effect a saving of 750 tons per annum. The electrolytic plant is 540 ft. long and has a normal production capacity of 1.8 million base boxes per annum (*El.*, 1949, *2*, 83-88).

A high efficiency anode for alkaline tin-plating is described by Lowenheim (*Jnl Electro.-Chem. Soc.*, 1949, *96* (4), 214-225). By incorporating up to about 1 per cent Al in the tin anodes c.d. can be markedly increased. This proved to be the best out of about 26 elements tried, and may be used with both K and Na stannate baths.

" Electrolytic Tinplating " (*Plating*, 1949, *36*, 1233—Dec.) is another useful contribution on that theme. CuSn plating with insoluble anodes is the subject of EP 621217, by the Thermit Corporation, U.S.A.

Silver as raw material in electroplating was described by H. G. Dale, of the Sheffield Smelting Co., Ltd. (*El.* 1949, *3*, Oct.). Among the patents is that of the Ministry of Supply (EP 615,925) for silver coatings on metals. Though not strictly concerned with plating, the paper by Griess and Rogers, on electro-separation of traces of Ag from Pd., may be noted here (*J. Electrochem. Soc.* 1949, *95* (3), 129-144). A method for high speed semi-bright silverplating is described in EP 617,786, by Standard Telephones & Cables, Ltd.

Some practical defects in chromium and their remedies are discussed (*El.* 1949, *2*, 6-11); also wear resistance of hard chromium deposits and recent German practice (*Ibid.* 543-4). Proceedings at the annual conference on hard chromium, at the Maison de la Chimie, Paris, are reported (*Galvano*, 1949, *18*, (148), 27).

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* A series of lectures on metal finishing at the headquarters of the society, Northampton Polytechnic, London, commencing January 11, 1950, has just been announced.

The date was May 20, 1949, and papers included: development of industrial applications of chromium plating in France, by de Buyer; magnetic control of coating thickness, by Brachet; applications to textile and glass industries; modern hard chromium plant, etc. An editorial note on the conference is by no means flattering. A more laudatory tone is sounded in an English review of the book (in French) on hard chromium plating, by Paul Morisset, director of the Centre d'Information du Chrom Dur, 1948, (*El.* 1949, *2*, 328).

Unsuitability of Tantalum

Tantalum again appears somewhat intractable as a coating. Seim and Holt report (*J. Electrochem. Soc.* 1949, *96* (1) 43-47) that the methods recorded in the literature have been tried by them, as well as methods of their own, but all were unsuccessful. This appears to apply also to Ta alloys. Fused baths, however, were not tried.

The electrodeposition of molybdenum from aqueous solutions has been described by Kayeki and Yntema (*J. Electrochem. Soc.* 1949, *96* (1), 48-56). Aqueous solutions of molybdic acids were used, containing high concentrations of salts: formates, acetates, fluorides, and alkaline phosphates. Optimum conditions are indicated: pH 5.5-6.8, c.d. 0.06-3.8 amp./cm^2, temp. 30-55° C., using Cu, Ni, or Fe cathodes and Pt or C anodes. Other metals, Fe, Ni, Co, may be co-deposited.

The same authors have also studied deposition of Mo alloys (*ibid.* *96* (4) 205-213), in a new aqueous citrate bath containing the sulphate. There is co-deposition of Mo, citric acid, and Na molybdate.

Electro-deposition of germanium with aqueous, non-aqueous, and fused electrolytes has been studied by Colin G. Fink *et al* (J. *Electrochem. Soc.* 1949, *95* (2), 80-97). When aqueous electrolyte is used, the effect is limited, apparently owing to very low hydrogen over-voltage. With alkaline solutions it was possible to co-deposit other metals, such as an alloy of Cu-Ge. The chemical resistance of this is high and the coating should have good protective as well as decorative value. The fused method was also described.

Beatson has treated the difficult problems of welding, brazing, and soldering coated metals in a comprehensive paper that evoked much discussion (*J. Electrodep. Tech. Soc.* 1949, *24*, 41-56). The most suitable coating for soldering steel or non-ferrous metals is tin. Among protective coatings for steel, the relatively new SnZn plating appears to be most easily soldered. In brazed assemblies it is preferable to plate after brazing, though several platings can be satisfactorily brazed. In the case of resistance welding, and more especially spot welding, several coatings are satisfactory.

Hill described the practical aspects of plating in the spoon and fork trade (*ibid.* 57-78); and Upton discussed its applications in the printing industry (*ibid.* 95-110).

On the important subject of tank linings and insulating materials, exposed to corrosive action of solutions, Evans gave much practical information (*ibid.* 129-146). He reviewed the principal materials used, including some that are relatively new. An all-purpose material, usable in all cases, has not yet been discovered.

The blistering of electro-deposits on Zn alloy die castings has been investigated by Wernick *et al.* (*ibid.* 195-210, 217-220). Many of the more serious defects of the past have been removed by advances made during the last decade, yet there is one difficulty still persisting, namely blistering. Methods for dealing with this successfully are described. Briefly, they consist mainly in careful storage under non-corrosive conditions, and protecting the castings between the as-cast or polished condition and actual plating. They should be plated as soon as possible after casting. The preparation of specimens for micro-examination is described.

K. E. Langford continued his series of articles on solutions (*El* 1949, 89-91, etc.); and Colgate another series on purification (221-8, etc.). The porosity of metal coatings was the subject of a paper by Pearson, of BISRA, read before the ETS on January 17; (see also *El.* 1949, 102-6). It was mainly a preliminary survey, as the work was by no means completed at that time. A. G. Sussex, in a contribution to a symposium in Australia, described electroplated coatings for corrosion protection (*El* 1949, *3*, 97-99.)

Patents

Among the numerous patents may be noted those of: British Thomson-Houston Co., Ltd., EP 615,110, for improvements in cleaning and electroplating processes; Westinghouse Electric International Co., EP 29242/1948 (open to public inspection) for electroplating apparatus; Etat Français, EP 4307/49 (o.p.i.) for surface superfinishing; Wilson & Ellis, USP 2,471,918, for electrodeposition of Cu; Max, USP 2,475,974 and 2,482,354, for electrodeposition of Cu; McCoy, USP 2,473,163, okating Ni on Al; Liger, USP 2,474,092, for electrodeposition of Pb; and Matson *et al*, USP 2,480,156, electrodeposition of iron.

Aluminium, magnesium, and their alloys occupy a special position in regard to surfacing, both on account of their importance and of the methods used. A very large amount of work continues, and only a small part can here be noted. Anodic oxide coating on Al has been described by Bradshaw *et al* (*J. Electrodep. Tech.* 1949, *24*, 147-170). Results were presented on anodising according to DTD Specification 910, with special reference to weight of coating, attack on metal, density and micro-porosity, and stress of formation. Some results obtained by the chemical MBV process are also given.

At the first National Exhibition of Industrial Finishing, 1949, were shown chemical and electrolytic finishes on aluminium, including some of the colouring effects—the subject of numerous patents and papers.

The deposition of metals on Al was described by S. Heiman (*J. Elect.-Chem. Soc.* 1949, *95* (5), 205-225), as well as a new process for depositing Zn, Cd, Sn, by chemical displacement. The immersion solutions used contained the metal sulphate and either HF or the fluoride anion. Very satisfactory results were claimed.

In addition to Bradshaw's above-mentioned paper, one by Bradshaw and Clark was also read to the ETS (May 16), on the anode film and its formation, (*El.* 1949, *2*, Sup. 491-5); and one by N. D. Pullen on anodising Al wire and strip (*ibid.* *3*, 3-8).

Among the very numerous patents may be noted those of: The Aluminium Corporation of America, EP Nos. 614,671, 621,874, for oxide coatings on Al; Cie. du Prod. Chim. et Metallurg, etc., EP 606,240, for treatment of Al surfaces; de Long, USP 2,474,181, for anodic coating on magnesium.

A Work on Polishing

It had been hoped that the second volume of Jacquet's outstanding work on the subject of electrolytic polishing would have been available before these notes were compiled—dealing with metals other than Al, Mg, and their alloys—but such is not the case. The first volume, published in 1948, dealt very fully with the light metals and alloys, but rather from the point of view of metallurgical research, e.g., micro-metallurgy, than that of industrial applications, although Jacquet's first researches were in this latter direction.

The electrolytic polishing of brass pressings was the subject of an interesting paper by P. Berger (Wm. Bate, Ltd., Walsall) at a meeting of the ETS. For articles such as cruet tops and the like this method offers the advantages of combined *o*-phosphoric acid and acid chromate solutions. The description of the mechanism indicates that the c.d. was 200-1200 amp./sq. ft. and temperature 40-50° C. If polishing is to be followed by plating passivity must be removed, especially that due to Pb compounds; (see also EP No. 603,545).

Electrolytic polishing in cyanide solutions is dealt with (*El.* 1949, *3*, 48-51), and electrolytic polishing of Ni in U.S.A. (*ibid.* *2*, 253-6). Surface preparation by electrolytic polishing is discussed by C. L. Faust (*J. Electrochem. Soc.* 1949, *95* (3), 62C-72C).

Among the patents are: K. T. Grubb, EP 604,056, electrolytic polishing; Aluminium Corporation of America, EP 613,487, electropolishing of aluminium; Westinghouse Electric International Co., EP 617,476, electropolishing silver by periodic current reverse; P. A. Charlesworth, EP 622,118, electrolytic polishing of stainless steel and nickel; Turner, USP 2,473,923, electrolytic polishing; J. F. Gall *et al* USP 2,481,306, electrochemical polishing of tantalum.

Barrel Methods

The old barrel plating and polishing methods are by no means extinct. They found, indeed, a staunch champion in, among other authorities, Dr. A. W. Wallbanks, president of the ETS, in a paper read to that society (*J. Electrodep. Tech. Soc.* 1949, *24*, 181-193, 213-6, "Barrel-plating to Specification.")

Although much barrel plating to-day is still old-fashioned, producing indifferent results, yet, with intelligent design of plant and lay-out, operation, and control, it can still prove a competitive method over a wide range. The paper evoked much keen and interesting discussion.

Another paper on this subject was that of Weiss (*ibid.* 171-180, 211-220), who described methods of deburring and polishing in barrels. These are of more general application than is commonly supposed, not limited to small articles. There was even more keen discussion here.

Recent developments in low tension power supply have been described by Ashby (*J. Electrodep. Tech. Soc.* 1949, *24*, 79-90), including improvements in oil-cooled selenium rectifiers in which there is no limit to the current: the higher the current the greater the advantages of the rectifier. Among important improvements is automatic control for operating at constant c.d. irrespective of area of work.

Automatic control has also been introduced in connection with chromic acid anodising. Plants have been running quite satisfactorily, as stated by Wernick and Willett at the 3rd International Conference. It is important to note that c.d. must be such that minimum thickness is used, although closer control is now possible with the improved system. Great Britain is now probably ahead of the U.S.A. in this field.

Statistical Quality Control

Some recent patents include: Westinghouse Brake & Signal Co., Ltd., EP 23695/48, (open to public inspection), for improved rectifier circuits; Martinet *et al,* USP 2,476,989, for selenium rectifiers; Wilson, USP 2,479,446, ditto; USP 2,477,364, for blocking layer rectifiers; Blackburn *et al,* USP 2,479,301, for selenium rectifiers; Driver, US 2,480,124, and Goodman, USP 2,481,739.

G. F. Mortimer Young has dealt comprehensively with statistical quality control, (*El.* 1949, *2*, 229-242). The paper was read before the Institution of Engineering Inspection. The methods are based on modern statistical theory and practice for the control of the whole series of operations from the inspection point of view, and deal mainly with the plating department.

Temperature control of steam-heated plating plants was discussed by the technical staff of Sarco Thermostats, Ltd. Thermostatic control systems have now become a common feature in process equipment. Automatic temperature control in vats and tanks not only saves fuel but necessarily improves quality, especially with chromium plating (*El.* 1949, *2*, 377-385).

Control systems for electrolytic processes are the subject of USP 2,471,912 and 2,473,918, in the name of Stoltz and Erbe. An apparatus for indicating degree of finish is claimed in EP 614,240, by J. R. Cornelius.

At the various trade and industrial exhibitions held in 1949 the electrochemical industries have been well represented in all their different branches, especially at the BIF, Birmingham section. At the first National Exhibition of Industrial Finishing, at Earls Court (August 31-September 13), a very good beginning was made, all kinds of finishes being shown.

More Mechanisation

A definite advance in mechanisation was demonstrated by the Roto-dip and spray plant at the Morris Cowley works, this being similar to the one at the Birmingham works of Fisher & Ludlow, Ltd. (*El.* 1949, *2*, 583-9; *3*, 13-20). This combines cleaning, phosphating, and primer painting in the one plant, in which the Carrier Engineering Co., the Pyrene Co., Docker Bros., Ltd., and I.C.I. (Paints), Ltd., have collaborated.

Stress-Corrosion Cracking: Tests on Welded Steel

INTERGRANULAR cracking occurring in welded mild steel gas mains carrying crude coke oven gas is associated with the factors normally causing stress-corrosion cracking in other alloys.

A study of the problem using a calcium-ammonium nitrate solution as the corroding liquid is contained in the December issue of the welding research supplement to the transactions of the Institute of Welding.

The report shows that mild steels differ in their susceptibility towards this type of failure according to their composition, provided tensile stresses of sufficient magnitude are present.

Parallel tests in a coking plant and in the laboratory using the above solution indicate a broad correlation between the failures occurring under the two different corroding conditions. Study of the problem in the laboratory and design of a further field test are considered justified.

In addition to the influence of composition and mode of manufacture of the steel and the effect of various stresses, it is apparent that cold working considerably impairs the resistance of steels to this form of failure and also that the phenomenon is amenable to anodic or cathodic control.

The part played by tensile stresses in the occurrence of these failures suggests that the alteration of the stress system in structures subjected to the corrosive conditions likely to cause this type of failure should form a practicable method of combating the problem.

In this respect, annealing at temperatures of the order of 300-400° C. suffices in rendering welded steel structures safe from stress-corrosion cracking in the calcium-ammonium nitrate solution, although the possibility that some mechanism other than stress relief is operative in bringing this about is not excluded.

Hammer and shot peening after welding have the same beneficial effect.

The Ruhr's Steel

German economic officials claim that the Ruhr district produced in 1949, 9,026,000 tons of steel, an increase of 3,626,000 tons over 1948. Production is still rising.

LEGISLATION AND CHEMICAL INDUSTRY

Some Changes During 1949

THE most important legislation in 1949, from the point of view of the chemical industry, has been the Patents and Designs Act and associated Patents Act and Registration of Designs Act. The two latter are purely consolidating Acts and, apart from observing that the treatment of patents and of designs is now in separate statutes, call for no comment.

The amending Patents and Designs Act completed the work proposed by the Swan Committee. It is a substantial measure of 58 sections, of which only those making considerable change in procedure can be considered now. An application for a patent may now be made by the person to whom the inventor has assigned his rights. The complete specification filed in pursuance of an application for a patent must disclose the best method known to the applicant of performing the invention. The rules affecting priority dates are altered to enable an inventor making application for protection in a "Convention country" to claim priority from the date of his application. But, to ensure this, the applicant must claim protection in this country within 12 months of his application in a Convention country.

Protection of Patents

New powers conferred on the Comptroller permit him, if he thinks a process for which an application has been made cannot be performed without substantial risk of infringement of another patent, to direct that a reference to the other patent be made in the application—by way of notice to the public. Additional grounds of opposition to a grant are that the invention was used in the U.K. before the priority date of the claim or that the invention is obvious and does not involve any inventive step, having regard to matter published in the U.K. before the priority date. The grounds on which a patent may be revoked by the Court have been completely rephrased.

Sections 15-24 cover ground that is largely new and deal with abuse and insufficient use of patent rights. At any time within three years of the sealing of a patent an interested person may apply to the Comptroller that the patent be endorsed "licences as of right" so that he will be able to make use of the process. The grounds on which the Comptroller make take this step are:—

(1) that the invention is capable of being worked in the U.K. and is not being commercially worked or is not being worked to the fullest practicable extent.

(2) that a demand for the patented article in the U.K. is not being met on reasonable terms or is being met to a substantial extent by imports.

(3) that the commercial working of the invention in the U.K. is being prevented or hindered by imports of the patented article.

(4) that because of the refusal of the patentee to grant licences on reasonable terms an export market is not being supplied, or the use of another patent is hindered, or the commercial or industrial activity of the U.K. is unfairly prejudiced.

If the applicant makes out his case the Comptroller may also grant licences to customers of the applicant on the terms he thinks fit.

The purpose of this new provision, as the wording of the Act discloses, is to ensure that the economic welfare of the whole community shall predominate. Section 16 instructs the Comptroller to exercise his power with a view to securing that inventions which can be worked on a commercial scale in the public interest should be so worked with the least delay and to the fullest extent; that the inventor or owner of the patent should be reasonably remunerated; that the interests of any person for the time being working or developing an invention should not be unfairly prejudiced.

Many Considerations

He must also take account of the nature of the invention, the time which has elapsed since the sealing of the patent and the measures already taken to make use of it; the ability of the person to whom a licence would be granted to work it to the public advantage; the risks which that person would have to undertake in providing capital.

Two years after Endorsing the patent on these grounds, the Comptroller may revoke the patent if there is a further application.

A government department may apply for a patent to be so endorsed. Wide powers are also vested in the government to use a patented invention for the services of the Crown. During emergencies the powers are even wider and correspond to the purposes for which Defence Regulations were permitted during the war. There are detailed provisions to preserve the secrecy of patents used for defence purposes and, to safeguard the inventor, the Government must give an account of use made of patented processes.

An attempt has also been made to reduce the high cost of litigation. Rules of Court are to be made to enable scientific advisers to sit with the Judge. All disputes as to infringement may now by consent be referred to the Comptroller. He may be asked to make a declaration as to the future, that a process would or would not constitute an infringement of a patent. An additional Judge of the High Court is to be appointed to specialise in patent matters.

A special section deals with claims for patents for chemical substances. Where a complete specification includes a claim for a substance, the claim will not be invalid on the sole ground that it is not limited to the substance when produced by specified methods. The Comptroller may refuse an application if he thinks that it claims as an invention a substance capable of being used as food or medicine which is a mixture of known ingredients possessing only the aggregate of the known properties of the ingredients or that the substance is produced by mere admixture.

Export Promotion

The objective of the Export Guarantees Act is to encourage trade with places outside the U.K. The Board of Trade, after consultation with the Export Guarantees Advisory Council and the Treasury, will be empowered to make arrangements for guarantees. These may be given for the benefit of persons carrying on business in the U.K. They must be in connection with the export, manufacture, treatment or distribution of goods, the rendering of service or any other matter which appears to the Board of Trade to promote the success of the export drive.

Statutory Instruments

The usual enormous range of subjects was dealt with by Statutory Instrument. Several of them were of major importance to the chemical industry. Perhaps the most important, relating to "Alkali Works" is still in draft form. Under the Alkali Works Regulation Act, 1906, the discharge of certain noxious or offensive gases from specified works was subjected to control. The draft Order adds the following gases to the list already dealt with—volatile organic sulphur compounds, fumes containing carbonaceous particles from black production works and fluorine.

The following classes of factories are brought within the Act: black production works, acid sludge works, fluorine works. The Act is also extended to include certain additional processes carried on in sulphuric acid works, chemical manure works, bisulphite works and cement production plants.

Rationing Relaxed

A number of rationing orders have been relaxed or abolished. By S.I.98 the orders controlling the production, distribution, acquisition and disposal of chemical fertilisers has been revoked. But price control remains, as is shown by SI1136. This alters the analysis of the fertiliser known as National Compound No. 2 and increases the price. The formula is altered to require the contents to be: Soluble P_2O_5 6.5 per cent; insoluble P_2O_5 0.5 per cent; K_2O 7 per cent.

SI 549, which dealt with molasses and industrial alcohol, provided that urea is no longer to be a controlled material. It also increased the prices of food for stock molasses. This was followed by SI 1001 which superseded the Molasses and Industrial Alcohol Order 1946. The control now applies only to molasses. Undenatured alcohol, acetic acid, acetic anhydride and butyl alcohol are decontrolled.

The maximum prices for ground sulphur were reduced by SI 1027. The production, disposal, use and consumption of sulphuric acid was decontrolled by SI 1934. Maximum prices for producers remain and are to be based on the prices charged them in the period April 1 to June 30, 1949.

The Control of Employment Act 1939 ceased to be effective from May 31, 1949.

The Development of Inventions Act was mentioned in THE CHEMICAL AGE at the beginning of the year. Regulations have now been issued under the Act dealing with the constitution of and qualifications for the National Research Development Corporation; the tenure and vacation of office by its members; the methods of entering into contracts and doing business and the observance of legal formalities by the Corporation.

Section 26 (1) of the Factories Act 1937 requires the employer to provide safe means of access to every place at any time. It has now been decided that the duty laid upon the factory occupier is not confined to his employees, but to any other person working upon the premises.

GERMAN RECOVERY

Heightening Resistance to Controls in 1949

NO period since the war has witnessed such profound changes as 1949 has produced in the capacity and prospects of German chemical industry. An incidental reflection of this new stature may be seen in the December special issue of *Chemische Industrie* in which nearly 100 editorial pages are employed to survey the present state of the industry and some imminent prospects.

The writer of the introductory article, reviewing some of Germany's past achievements in the chemical field, characteristically denies there is any foundation for the charge that German chemical industries were interested in military intrigue.

This and subsequent articles contribute one of the most comprehensive reviews of work and events in German chemical affairs during the past four years. Strenuous efforts have been made to re-establish such branches of industry as are permissible, but under very great difficulties, of which lack of proper organisation—always a primary requirement of German industry—has been among the most formidable.

Dr. S. Balke, of Munich, describes in detail some of the attempts at reconstruction, in conditions of extreme uncertainty, and presents production figures for the pre-war and post-war periods. The greatest problem is recognised to be to secure increased exports. Despite Allied efforts to improve export prospects, many new difficulties have arisen. These include the “ liberalising ” of European trade, and obstacles in the way of constructing the German tariff system.

Possible Japanese Dumping

The German writers do not underestimate the possible effects of the clouds arising in the East and the potential threats to the U.S.A. and especially England, and the possibility of Japanese dumping.

Fear of German commercial revival is considered still to be profound, and, in Dr. Balke's opinion, is strengthened by statements of certain German politicians who seek to restore the old “ reactionary monopolistic large scale capitalist system.” Other difficulties relate to financing, the urgent need of which can not be satisfied by foreign credits only. Any hopes that foreign capital would flow into German industry on a substantial scale are thought to be illusions.

The recent agreement (November 24, 1949) is admitted to have improved the position of German industry in relation to dismantling, and there are brighter hopes that the “ Expiation ” attitude is going to be less in evidence. The Fischer-Tropsch process is again mentioned. Disputing claims that Germany's production of fuel oil by hydrogenation or otherwise could constitute a menace the writer cites the fact that, at the time of maximum output in the Spring of 1944, that process provided no more than 6.9 million tons, or about 5 per cent of the U.S. programme. Dr. Balke is another of those who plead the great importance of this process in providing synthetic fats, of which Germany is in great need.

Interest in World Economy

At the end of 1949 the prospects of making an effective new start are still obscure. The attempt to establish a European economic bloc is a first step to a free world economy, in which Germany on historic and other grounds should be interested. To achieve this it is essential among other things, says the writer, that present contradictions between Allied theory and practice should be reconciled.

A detailed and critical review of West German chemical imports and of Allied policy and the controls governing them is given by Dr. W. Koeck, of Frankfurt. Chief among the numerous control bodies are the JEIA (Joint Export-Import Agency), the ECA (Economic Control Agency) and the BICO (Bi-partite Control Office). Several others are mentioned. Some import figures (in $ million) are tabulated for the last two quarters of 1948 and first two of 1949, with totals and estimates for 1948-50, Marshall-Plan years. The principal categories are these:

	1948 qtrs.		1949 qtrs.			Marshall Plan Years	
	3rd	4th	1st	2nd		1948-49	1949-50
Vegetable/animal oils and fats ...	4.5	5.1	10.2	10.6	=	30.4	28.3
Resins, turpentine oil, gums and waxes	2.5	1.7	3.3	2.3	=	9.8	13.0
Raw materials (vegetable and animal)	2.2	1.8	4.7	3.2	=	12.0	12.0
Raw materials (mineral)	2.8	0.3	0.6	2.2	=	5.9	13.7
Semi- and finished chemical materials	6.6	5.3	7.3	7.2	=	26.4	25.4

The addition at the beginning of 1949 of one more to the already over numerous control bodies—the Import Advisory Committee—does not appear to have improved matters, and is being held responsible for serious increases in prices of some imports, *e.g.*, 100 per cent for essential oils and agar-agar. It is, in fact, estimated that the total rise in values for 1949 amounted to no less than $55 million, and was particularly severe in the paint and varnish, synthetic resins, sulphuric acid and fertiliser (superphosphate) and other industries, causing substantial increase in prices of finished goods.

Import Free Lists

Still more important changes in the structure of German import trade are taking place under the so-called liberalising of West European commerce, including "free lists" for all participating countries except Switzerland and Belgium (A1), free lists subject to price limits (A2) and conditional free lists (B).

Some details are given of agreements with Switzerland, Netherlands, Austria, Norway. Other agreements are under negotiation with Belgium, Sweden, and France. The writer concludes that the success of this liberalising policy will depend largely on the extent to which other countries follow the German example in respect to free lists. In Germany this comprises about 50 items in the chemical category from which all tariffs have been removed. Meanwhile, ordinary trade agreements have been concluded with 31 countries.

On the export side, the estimated volume of trade for the Marshall Plan year 1952-53 is reckoned at $800-350 million. Pre-war figures are given in considerable detail. For the twelve months ended December, 1948, the total for the bizone was $34,332,000 (Dm.110,064,000); and for the nine months ended September, 1949, it was $51,906,000 (Dm.176,039,000). Some of the principal items for these periods included ($1000):—

	1948	9 months 1949
Tar distillation, products	1,545	490
Calcium chloride, potass. sulphate, etc.	3,057	2,675
Special semi-manufactures	876	3,556
Nitrogen fertilisers	286	195
Plastics	509	663
Coal tar dyes	8,130	12,275
Paints, varnishes, etc.	4,765	7,456
Special chem. products*	8,918	12,610
Oil and fat products, soaps ...	50	173
Photochemicals	365	699
Pharmaceuticals	3,427	4,543
Special chem. products†	747	2,080

* Primary or intermediate.
† Finished.

The totals for the two periods represent 5.6 per cent and 6.6 per cent respectively of total German exports.

In discussing the present position of Germany's heavy chemical industry, Dr. E. Herzig (Frankfurt/Main-Höchst) takes the usual yardstick as a guide, namely, sulphuric acid production, quoting some pre-war figures for world and principal countries' output. In Germany in 1943 it was 3.28 million metric tons, as compared with 7.9 in the U.S.A. Output in the bizone in 1938 was 1.36 million metric tons, in 1948, 0.76, and in 1949 (estimated) 0.85 The last was just over one-quarter of all-Germany's peak for 1943. Principal fields of use in percentages for 1948 are given for U.S.A. and the bizone:—

	U.S.A. Per Cent	Bizone Per Cent
Fertilisers	36.5	56.0
Misc. chem. industry	20.7	13.4
Mineral oil refining	10.7	1.3
Textiles (art. silk, etc.)	6.5	9.0
Paints and pigments	6.8	1.3
Carbon products	6.5	—
Iron and steel (metal treatment) ...	5.7	3.3
Other metallurgical uses	3.2	—
Explosives	1.3	—
Organic intermediates and dyes ...	—	8.8

Home production of pyrites in 1948 was 383,102 tons and 488,800 tons were imported. Output of alkalis (soda and caustic) was severely restricted after the war by lack of power and raw material. Recovery during the past year or two has been substantial: soda output rose from 235,000 tons in 1947 to 356,000 in 1948; and caustic from 90,000 to 152,000 tons, the former nearly reaching and the latter greatly exceeding pre-war figures. During the last three quarters of 1949, production of most heavy chemicals shows an increase over 1948.

French Sulphur

WITH the resumption of normal imports of sulphur from Sicily and the U.S.A., French sulphur mines are reported to be experiencing a serious decline. Two main exploiting groups exist in France: the Sté. Languedocienne de Recherches Minières, which is still actively engaged with the problem of economic improvement of its minerals, and the Sté. des Mines de Soufre d'Apiqui whose production has dropped constantly. In 1949 activity was almost nil and production under 100 tons. While there is no question of the output of French sulphur mines replacing imports, which amount to 200,000 tons annually, it is recognised that this source is of special importance during periods of difficulty in international exchange.

The Chemist's Bookshelf

Organic Syntheses. Vol. 28. H. R. Snyder, Editor-in-Chief. 1948. New York: John Wiley. London: Chapman & Hall, Ltd. Pp. 121.

The latest annual volume of this invaluable series of "satisfactory methods for the preparation of organic chemicals" maintains the high standard of its predecessors. The editorial board, assisted by 59 contributors, provides detailed, checked recipes, with notes, for the preparation of 37 organic compounds, of which seven are aliphatic, 20 aromatic, two alicyclic, and six heterocyclic. Research interests of recent date are well represented; for example, by Cason's procedure for branched-chain keto-acids, by the procedure of Swern *et al.* for hydroxylation with performic acid, and by preparations of vinyl and styrene derivatives, and of various sulphur compounds. The subject index is cumulative, covering volumes 20 to 28.—R.G.R.B.

The Limestones of Scotland. (Special Reports on the Mineral Resources of Great Britain, Vol. XXXV). Pp. 221, 7 plates, 43 text-figures; HMSO. 17s. 6d.

"The Limestones of Scotland" is the result of co-operation between the Geological Survey and the Macaulay Institute for Soil Research, stimulated by urgent needs during the war. All known sources of limestone were brought under review, representative samples were analysed, and the geological occurrence of the more promising deposits was studied with a view to assessing their potentialities. The result is a detailed account of all the significant limestones in Scotland backed by a series of 175 analyses.

The introductory chapters are written to provide an account of limestone and its uses for the non-technical reader; but they also give a summary of the scientific results that have emerged from the study of the great variety of types of limestone to be found in Scotland and a general description of their distribution. The thick Cambro-Ordovician dolomites of the North West Highlands, the crystalline metamorphic Dalradian limestones of the Grampian country, the Carboniferous limestones of the Central Valley, and the shell sands of the Hebrides, each group has its own economic interest and importance. The dolomites of Sutherland, Western Ross and Skye are as yet virtually untouched and constitute a valuable reserve of high-grade magnesian limestone. The more or less altered limestones of Islay, south-west Inverness-shire, central Perthshire and Banffshire are in some cases of sufficient purity to suggest exploitation for chemical manufacturing purposes. The carboniferous limestones of the Central Valley, though seldom exceeding 20 ft. in workable thickness, have been freely quarried for over 200 years. Their main uses are for lime-burning, agricultural ground limestone, flux and cement-making.

The memoir had its source in the series of wartime pamphlets dealing with limestone in Scotland and it supersedes them in most respects. It is freely illustrated with county and locality maps and detailed descriptions of deposits and workings are arranged under county headings.

Annual Reports on the Progress of Chemistry for 1948. Vol. XLV. 1949. London: The Chemical Society. Pp. 379. 25s.

With this volume the Chemical Society continues its policy of presenting summaries, by experts, of recent progress in selected chemical subjects. The topics here covered are as follows: in physical chemistry, aqueous soap solutions, and kinetics of gas reactions; in inorganic chemistry, reaction induced by ionising radiations, structure of aqueous soap solutions, and kinetics of gas reactions; in inorganic chemistry, a general survey of the groups of elements; in organic chemistry, general methods, homolytic reactions, terpenes, colchicine and related compounds, reactions of organic sulphur compounds, and heterocyclic compounds; in biochemistry, the function of small molecules in biosynthesis, partition chromatography, insulin, and chemotherapeutic approaches to the tuberculosis problem; in analytical chemistry emission spectrography, flame photometry, volumetric analysis, etc.

ANALYSIS OF COAL ASH

New Fuel Research Paper

A RECENTLY published report of the Fuel Research Station, DSIR, " Improved Methods for the Quantitative Analysis of Coal Ash and Coke Ash " (HMSO, 1s.) forms a basis upon which fuel users may build a useful collection of methods of preparing all types of coal ash and its more important constituents.

The preparation of ash for analysis by the " standard " method, using small quantities of coal in thin layers, is retained only for certain special analyses. A simpler and shorter method for the preparation of the bulk sample is described, with instructions for the application of correction factors.

The separation of silica has been simplified and the time of baking reduced. This also has the advantage of making the dried residues more easily soluble.

Barium in Coal

At one time, the occurrence of barium in analytical quantities in coal was considered to be unusual, but its presence in many coals has now been confirmed. A method for the determination of barium has, therefore, been included in the general scheme. During the determination of silica, the presence of barium is easily recognised, and its determination is relatively simple.

The treatment of the iron group has been changed, so that no separations of members of the group are required; iron and titanium are determined separately by specific methods.

The technique for the determination of phosphorus has been completely changed. The new method was devised by the Northern Coke Research Committee, the repeated fusion of the ash with sodium carbonate being avoided.

In the section of the survey paper dealing with the actual analyses, detailed instructions are given on the right-hand pages in a series of numbered paragraphs. On the corresponding left-hand pages are a series of notes to assist the analyst. These include suggestions for apparatus, the reasons for certain steps and general precautions to be observed.

Attached to each copy of the paper is a diagram illustrating the analytical scheme and quoting the appropriate paragraph numbers concerned with each stage of technique.

TRAINING IN MANCHESTER

Part-time Study Needs

MANCHESTER, which is the headquarters of the active and enterprising North Western Branch of the Institution of Chemical Engineers, has been accused of being backward in providing facilities for the part-time teaching of chemistry. This lack—in an area which he describes as " one of the main centres of the chemical and allied industries "—is deplored in a recent letter to the *Manchester Guardian* by R. Barstow, secretary of the north-west area of the Association of Scientific Workers. Many chemical firms in the district are fully prepared to grant time off for study, Mr. Barstow claims, but the lack of suitable courses in Manchester necessitates travel outside the city by students.

Those already in industry are, therefore, denied the opportunity of studying for technical qualifications. Students in the colleges of other local authorities, states the correspondent, work under seriously overcrowded conditions, but in Manchester itself, not even these meagre benefits exist. Emergency measures, such as the taking over of temporary rooms and the use of more part-time lecturers from industry, are recommended.

Atomic Plant Apprenticeships

AN opportunity for boys to make a career in atomic energy applications by qualifying as craft apprentices is offered by the Ministry of Supply.

A five-year apprenticeship for youths of 16 was announced last week by Mr. F. C. Wake, Northern Regional Controller. The course will be at the Atomic Energy Establishment, Windscale Works, Sellafield, and Cumberland boys will have a preference.

Besides learning a basic craft the boys will be instructed in the use of plastics, ferrous and non-ferrous metals and special attention will be given to automatic control equipment. It is hoped later to include a grade of engineering apprentices.

Uranium in Australia

The presence of a field of uranium ore at Rum Jungle, 60 miles south of Darwin, has been confirmed by geologists of the Australian Bureau of Mineral Resources. Further tests are being made and a report is expected soon on the richness and extent of the field. The Premier of South Australia has announced that production of uranium, on a small scale, from local deposits will begin this year.

An Introduction to Colorimetry

Wider Studies of Light and Colour

THE technique of colorimetric analysis is finding a continually increasing number of applications in industry, medicine and agricultural and other sciences. One of the simplest of the methods of determining the presence of specified substances, it attains a high standard of accuracy.

Many excellent technical works have been written on the subject for the use of the scientist or expert, but there are still many unfamiliar with the technique and its possibilities.

A non-technical picture giving an outline of the importance of colour measurement in everyday life has been written in the form of a booklet, " Colour and the Visual Measurement of Colour," by A. J. Fawcett and published by The Tintometer, Ltd., Salisbury (1s. 6d.).

Early Days

After a brief explanation of the fundamentals the author describes the evolution of the colorimeter from the first instrument made from a tea caddy, by Joseph William Lovibond, a Salisbury brewer.

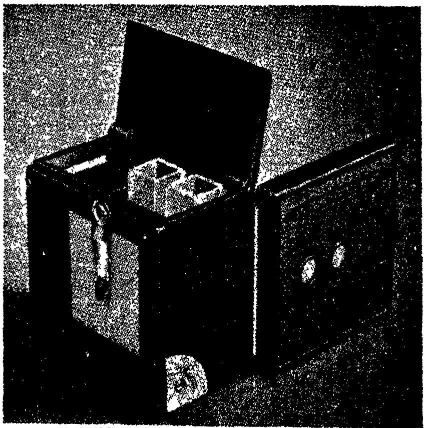
The need for chemical reagents when dealing with substances which naturally are colourless in solution is explained, and it is shown how, when the density of this colour is measured with a pre-determined scale, the concentration of the substance in the solution can be ascertained from the colour reading.

Various types of colorimeter, the Lovibond-Schofield tintometer, the all-purposes comparator, and the B.D.H. Lovibond Nesseleriser (for measuring the colour of very pale solutions), are described.

Detecting Gases

Among the wide variety of relatively simple applications of colorimetry in industry is a portable set for the detection of noxious fumes or gases. The method of calculating the percentage of gas in the atmosphere is by means of an aspirator, which delivers a measured quantity of the air-gas mixture to a chamber which contains either a specially prepared filter paper or a vessel containing a chemical solution through which the air is made to bubble.

The noxious gas is arrested or dissolved and a colour is developed, in one case by a chemical reagent present on the filter paper, and in the other by a chemical reagent in the solution.



[Courtesy, The Tintometer, Ltd., Salisbury

The all-purposes Lovibond comparator, which may be used for measuring the colour of solids by reflected light and for the tests for noxious gases, in which paper filters are employed. Cells of varying optical depth up to 4 cm. may be used

Other varied uses of colour include tests for assaying the pH of soil; gaining accurate information as to the chemical and bacterial content of milk; in medicine for testing the percentage of a drug in the blood stream; and in the oil industry in which technologists employ the tintometer for a variety of chemical colour tests.

Colorimetry can be said almost to have created a new industry—the manufacture of the various types of glass cells required to hold the liquids to be measured.

Many factors go to the making of a cell required for use in the measurement of colour. Accuracy of measurement is essential between the two faces of the cell. The glass itself must be of perfect optical quality, without colour or blemish, free from strain and having solid homogeneous joints, so that the cell is proof against chemical attack.

No Licence Required

The commercial drying of vegetables has been released from licensing restrictions from January 8.

Technical Publications

MODERN methods of production and material handling are becoming increasingly mechanised and the continuous conveyor is becoming an integral plant unit. To meet the demand for a continuous automatic conveyor weight totaliser the Adequate weigher, which accurately integrates and records the weight of goods travelling upon a conveyor, has been designed by Adequate Weighers, Ltd., London. The machine is described and illustrated in a pamphlet just issued.

* * *

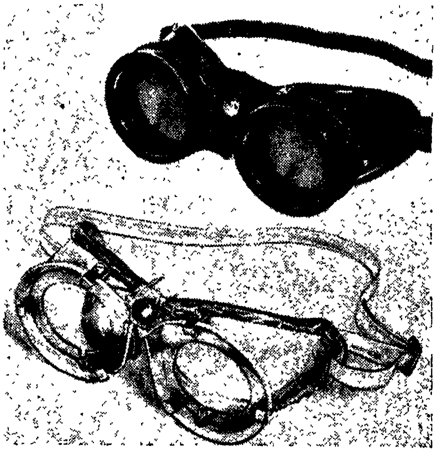
FREQUENT valve failures have been one of the problems connected with HF preheating equipment. The General Electric Co., Ltd., has sought to overcome this trouble in its new plastic preheater, making use of a single valve oscillatory circuit employing an Osram valve and incorporating a voltage stabilising transformer in the oscillator valve filament supply. In the preheater (described in the company's bulletin Press/J/70) controls have been reduced to a minimum. It is wired for 3-phase, 360/440 volts, 50 c/s supply. The oven will accommodate several pounds of plastic pellets which can be raised to preheating temperature at rates up to 1½ lb. per minute.

* * *

INCREASING needs for a bridge capable of measuring the conductivity of electrolytes at various frequencies in the audio range have resulted in the production by Muirhead & Co., Ltd., Beckenham, Kent, of a new assembly. This is composed of universal units which can be broken down when no longer required. The bridge, fully described in the new bulletin B-648-A, resembles the Wheatstone bridge in circuit, with the addition of a variable capacitance in parallel with the balancing arm to compensate for the capacitance of the electrolytic cell, in which the electrolyte under test is contained.

* * *

THE use of Detel (manufactured by Detel Products, Ltd., Greenford Middlesex) for the protection of fighting vehicles against corrosion is recommended in a report (T.370/412) issued by the Chief Inspector of Fighting Vehicles, Ministry of Supply, Chislehurst, Kent. Tests have shown good results, using Detel as a primer for tank parts, vehicle chassis, and similar parts which are difficult to inhibit during manufacture without considerable pre-cleaning before the application of a priming agent. The treatment has afforded complete protection for a year under tropical conditions.



[Courtesy, R.F.D. Protective Clothing, Ltd.

A new system of ventilation which allows air to circulate freely between the eye-cup and the lens is employed in these industrial goggles—for cooling and to prevent misting-up

* * *

THE compositions and properties of the tin-containing fusible alloys and their more important industrial applications are described in a booklet now available from the Tin Research Institute, Greenford, Middlesex. The booklet, entitled " Fusible Alloys Containing Tin," contains a number of useful reference tables and 15 illustrations.

* * *

HOW necessary it is to reduce titanium production to an economic basis to permit it to become a force in industry is emphasised in " Titanium—Tomorrow's Metal," by W. B. Morrissy in the December issue of the Canadian Industries, Ltd., magazine *The Oval.* Other features include an article on Chemurgy by Philip A. Novikoff and " The Search for Light "—from the wicp dipped in oil to the fluorescent lamp —told by Peter Cahn.

* * *

A MULTI-purpose gas-fume respirator of U.S. origin, designed to give protection and working comfort at the same time, has been announced by the Mine Safety Applications Co., Africa (Pty.), Ltd. (P.O.

(continued at foot of next page)

Geological Survey of Northern Rhodesia

£67,600 Grant for First Five Years

FORMING part of an allocation of over £1 million made during 1948-49, under the Colonial Development and Welfare Acts, for the expansion of Colonial geological surveys, a free grant of £67,600 has been approved by the Secretary of State for the Colonies for geological surveying in Northern Rhodesia. This sum is proposed to cover expenditure over a 5-year period and includes a suggested capital outlay of £25,150.

The new survey unit, which is to operate under the Northern Rhodesian scheme drawn up by the Central African Council, will probably have its headquarters at Ndola, in the main prospecting area. Most of the existing geological records are available at the office of the Senior Inspector of Mines in Ndola, within easy access of the Copperbelt, and this should facilitate co-operation with the mining companies.

It is hoped to obtain the services of a geologist and a senior geologist this month (December), and of two more geologists in 1950, reports the Central Office of Information (*Commonwealth Survey*, No. 37), from which source this information is reproduced.

During the last twenty years Northern Rhodesia has developed its copper and cobalt resources until, in recent years, it has become the leading British Colonial producer of these metals.

Copper, which is by far the most valuable mineral mined, remained relatively undeveloped until 1925, when large deposits of copper sulphide ores were discovered at Nchanga and Roan Antelope. Production of the metal has risen from 5980 long tons in 1928 to 213,616 long tons in 1948. All the economic copper deposits being worked are in the Copperbelt, where proved reserves are now about 500 million tons.

In the same period, lead output has increased from 4676 to 13,020 long tons, and zinc from 13,176 to 22,170 long tons. During the period 1930-1947, the total value of mineral production reached nearly £176¾ million: the value in the single year 1948 totalled £23½ million.

There have been three major developments, within the past 20 years, at the lead-zinc-vanadium deposits at Broken Hill, discovered about 50 years ago. In 1929, the Broken Hill Development Co., Ltd., began a new phase of production with an electrolytic zinc extraction plant; in 1931 the production of fused vanadium oxide was initiated; and an extensive drilling and development programme took place between 1935 and 1946 to discover sulphide ore-bodies at depth. Following a geophysical survey drilling is now taking place to locate any further deposits.

It is believed that there are extensive mineral deposits yet untapped.

TECHNICAL PUBLICATIONS

(*continued from previous page*)

Box 1680), Johannesburg. The complete respirator weighs only 2 lb. 14 oz., and employs twin independently replaceable mechanical and chemical filters mounted on the wearer's back. It is said to afford protection against mists, dusts, fumes, organic vapours and acid gases.

* * *

USES of corrosion-resistant alloy steels in the heavy chemical industry and the types of duty to which each class may be applied are examined by F. H. Keating (Imperial Chemical Industries, Ltd.) in the main article of the December issue of the *Nickel Bulletin* (the Mond Nickel Co., Ltd., London).

* * *

THE high standard of reliability required of modern radio apparatus and its many applications necessitate the employment of specialised material for each particular job. Specification RIC/1000/A, recently issued by the Radio Industry Council, is intended as a guide to manufacturers in the choice of materials for radio and electronic equipment. It is divided into two sections which include metallic materials; plastics; elastomers; inorganic insulating materials and insulating, filling and sealing compounds.

* * *

THE large variety of pumps available are indicative of the exacting needs of industries. Viscous liquids such as molasses, crude oils, tar, bitumen, soap and fats have required the production of special pumps such as the Transflo rotary displacement pump, which is described in the current issue of "Wiggin Nickel Alloys" (Henry Wiggin and Co., Ltd., Birmingham). Other articles include the use of Inconel in medical equipment and the application of nickel to ocean depth sounding equipment.

SOUTH AFRICAN ENTERPRISE

Exploiting Local Raw Materials

FISH body oils are to take the place of imported fats—fast becoming scarce—in the manufacture of soap in South Africa. In 1950 the Union anticipates producing more than 10,000 tons of fish body oil, four-fifths of which is expected to be consumed in the country. This, used in place of imported fat, will not only alleviate the threatened scarcity of soap, but will save the Union about £500,000 in foreign currency next year. The combined South African fishing industry, which operates its own refinery at Simonstown, recently made an offer to all the large soap manufacturers to supply them with this oil at local ruling prices.

Application has been made to the Board of Trade and Industries for the admission under rebate of duty of acetic acid employed in the manufacture of a corrosion-resistant coating for metals produced by a local firm under licence. Acetic acid is dutiable under tariff item No. 212, under which bulk glacial acetic acid, which contains 99 per cent of acetic acid and is the product used by the applicant firm, is dutiable at 32s. per gal. Glacial acetic acid, however, is not at the moment produced in the Union.

Columbit (Pty.), Ltd., 106 Loop Street, Cape Town, plans to establish a factory to make asbestos filter material for the preparation of medicines, the bottling industry, wine merchants, breweries, and for water filtration and oil filtration. Practically all the raw materials required are available in the Union. The technical manager of the Columbit factory at Wiesbaden, Germany, is to go out to the Union to take charge of technical arrangements.

Associated Lead Manufacturers (Pty.), Ltd., Jacobs, Durban, is erecting a new factory for the manufacture of red lead, white lead and litharge for battery manufacturers. etc. Much of the plant in this factory has been made in South Africa. This local company is associated with the U.K. concern, Associated Lead Manufacturers Export Co., Ltd.

Coates Inks, Ltd., has established a local factory at Parow, near Cape Town, in which it is now manufacturing to British specifications printing inks for all processes. These are being made to the same standard of quality as the British inks of the parent company. It is intended to use local materials, as far as possible.

TRADE IN SWISS CHEMICALS

Heightened Market Difficulties

IN its review of Swiss economic developments during 1949, the *Quarterly Bulletin* of the Credit Suisse states that the chemical and pharmaceutical industries, in common with other Swiss industries depending on sales in foreign markets, have been affected by the increased satiation of markets, the growth of foreign competition and the lowered purchasing power of foreign customers.

This important sector of Switzerland's national economy has not been able to maintain exports—which normally amount to one-sixth of total exports—on the 1948 level. Exports of aniline dyes are stated to have declined sharply; in particular sales in Czechoslovakia, but also in the other countries of Eastern and South-Eastern Europe—all important markets before the war—have been reduced.

It has been possible, however, to increase sales to Western Germany and, as a result of compensation transactions, to Egypt and Chile. Exports of auxiliary products for the textile, leather, and paper industries were maintained on the pre-war level despite reduced import quotas.

A welcome increase has been registered in the volume of sales of agricultural chemicals and insecticides, in spite of stiff competition, import and exchange restrictions. Exports of pharmaceuticals goods were slightly improved.

Prices were exposed to strong pressure and, although employment was still satisfactory at the beginning of 1949, staff reductions have since become necessary in many enterprises. Since almost one-half of the export of chemical and pharmaceutical products goes to OEEC countries, it is hoped that the " liberalisation " of European trade will improve sales prospects of Switzerland's chemical industry. It is recognised, however, that the effect of the freedom from quotas has in several countries been negatived to a large extent by increases of customs tariffs.

Pharmaceutical Production in East Germany

Reports from East Germany state that the Microbiological Institute of the nationalised Schott Works in Jena is to be developed into a large producer of pharmaceutical products. Penicillin production is stated already to be sufficient for domestic needs and exports are proposed. Other products are novocaine and morphine.

Indian Chemical Research

Industrialists Urged to Take More Interest

INDIAN chemical manufacturers' dissatisfaction with the Government's handling of import, taxation and marketing policies was expressed at the annual session in Bombay of the Indian Chemical Manufacturers' Association.

The Governor of Bombay (Raja Maharaj Singh), inaugurating the session, called upon the industrialists to take a greater interest in research work and to finance the development of laboratory results into actual commercial production. The Governor emphasised that India's industrial life depended to a large extent on technological advance and discoveries of improved chemical processes.

The Government of India, he said, had planned a chain of regional national chemical laboratories all over the country. These would undertake work that did not ordinarily fall within the scope of industries and their activities would cover a large field, extending by stages from research work of the purely academic type to technical development of processes and equipment.

Mr. S. P. Sen, president of the association, claimed that the liberal import policy followed by the Central Government had largely nullified the expansion projects of the chemical industry. He said that the Government should help the industry in developing new markets for India's trade in chemical products and by encouraging greater production.

Chemical industries in India were facing great difficulties keeping prices at a low level. He urged the Government to revise the basis of the classification of the raw materials and finished products.

As a result of the Government of Bombay's proposal for the large-scale production of power alcohol, to utilise surplus stocks of molasses and to save dollars on petrol imports, the Nasik Distillery, Bombay's liquor manufacturing centre, is to begin producing 3000 gal. of power alcohol a day after April 1, 1950. The sale of alcoholic liquor in the Province ceases on that day.

A plant costing Rs.50,000, ordered from the United Kingdom, is expected in Bombay this month. Almost the whole of the Nasik Distillery will be converted into a power alcohol factory.

The Government of Bombay has also decided to permit private manufacture of power alcohol in the Kolhapur and in two other sugar factories. The Kolhapur factory already has a plant and two more plants are expected soon.

The Government of India has given sanction to the Bombay State Transport Authority to mix denatured spirit with petrol, and experiments conducted by the transport authority have shown that the ratio of the mixture of petrol and power alcohol should be about 60 : 40, or 50 : 50.

The mixture of power alcohol and petrol will initially be used in heavy vehicles.

The annual production of the Nasik factory is expected to exceed 900,000 gal. From January to August, 1949, a total of 2,168,864 gal. of power alcohol was produced in India, compared with 3.52 million in 1948 and 2.2 million in 1947.

India May Refine 25,000 Tons More Copper

THE Government of India has been investigating the possibilities of setting up a copper refinery plant to make India self-sufficient in copper.

Arising out of the Government's decision to set up national industries for manufacturing radio transmitters, heavy electrical equipment and cables, it is estimated that India's copper consumption will rise from a little over 35,000 tons to about 60,000 tons per annum.

The setting up of a plant for refining copper from scrap was considered recently by the Development Committee of the Indian Ministry of Industry and Supply. The technical aspect of the project was investigated in England and the U.S.A. and it was ascertained that conditions in India were favourable.

Investigations in the United Kingdom revealed that a new process of refining copper from scrap at the rate of 25,000 tons per annum could be worked economically in India at an estimated cost of £180,000.

India produces only about 6000 to 7000 tons of refined copper annually from the Bihar mines, which meets barely 20 per cent of her total requirements.

· PERSONAL ·

PROF. ARTHUR PORTER, first occupant of the chair of instrument technology in the Military College of Science, Shrivenham, has left to take up the post of director of research in the Canadian branch of Ferranti, Ltd. During the war the professor worked in various Government research establishments, and in 1946 he joined the National Physical Laboratory where he started a new section on automatic control problems of industry. He will be succeeded by MR. C. HOLT SMITH.

DR. J. W. MCDAVID, chairman of the Nobel Division, I.C.I., Ltd., who has recently returned from a 50,000 mile tour of the U.S.A., has accepted the chairmanship of the new FBI committee in Scotland.

DR. PATRICK D. RITCHIE, formerly head of the department of chemistry, Central Technical College, Birmingham, has taken up his appointment to the chair of chemistry at the Royal Technical College, Glasgow.

SIR JOHN LENNARD-JONES, Plummer professor of theoretical chemistry, Cambridge University, has been nominated a member of the honorary Advisory Scientific Committee of the National Gallery.

MR. ROBERT S. P. WITTUS, a chemist employed by I.C.I., Ltd., at Blackley, and MISS MARY THOMPSON, of Moor Lane, Kersal, a typist in the firm's Manchester office, were married at St. Paul's Church, Kersal, Salford, on December 31.

MR. J. A. HUNT, general manager of the Hymatic Engineering Co., Redditch, Worcs., and chairman of the Birmingham Advisory Committee, Midland Regional Board for Industry, was awarded the M.B.E. in the New Year Honours List for his work in the field of industrial relations.

The title of reader in biochemistry at University College, London, has been conferred on DR. L. MARGARET KERLY.

MR. M. A. COLEFAX and DR. P. H. FRANKEL have been appointed directors of Manchester Oil Refinery, Ltd.

MR. KENNETH G. HOLDEN, chairman of Hardman & Holden, Ltd., Manchester, has been appointed a director of Williams Deacon's Bank, Ltd.

Two new Fellows and seven Associates have been announced by the Textile Institute. Elected to Fellowship are: CHARLES PERCIVAL TATTERSFIELD, assistant manager, Courtaulds, Ltd., Use Development Organisation, Manchester, who has taken out several patents dealing with differential saponification treatment of cellulose ester materials; ALAN BREARLEY, Halifax, technical officer, Wool Industries Research Association. New Associates included ALBERT EDWARD WATTS, Abbey Hey, Manchester, who passed the institute's general textile technology examination at the age of 21, and DARAS NESERWANJI MEHTA, chemist at the Empress Mills, Nagpur (C.P.), India.

The following appointments have been announced by Thomas W. Ward, Ltd., Sheffield: MR. ASHLEY S. WARD, who resigned from the chairmanship, which he had held since 1941, is appointed president. MR. GEORGE WOOD succeeds him as chairman and MR. FRANK R. STAGG becomes deputy chairman. MR. H. W. SECKER and MR. J. WHALTON are joint managing directors.

Obituary

DR. T. LEWIS BAILEY, whose death at Redhill (Surrey) is announced, at the age of 85, was formerly H.M. chief inspector of alkali, etc., works from 1920 until his retirement in 1929. During his tenure of office he devoted much time to the question of effluents from ammonia plants. He also took particular interest in water scrubbing of Gay Lussac tower gases as a means of reducing the acidity of sulphuric acid plant escapes.

The death has occurred suddenly of MR. W. G. FEAKES, cost accountant and personal assistant to the managing director of British Tar Products, Ltd., Sheffield, for nearly 30 years.

Memorial Service

A memorial service will be held at St. Martin-in-the-Fields, London, on Thursday, January 19, at 12 noon, for Mr. Norman Neville, director of the British Chemical Plant Manufacturers' Association, whose death was announced in our last issue.

◆ HOME ◆

Linnean Society

The Linnean Society has amended its bye-laws to limit its membership to 1000, exclusive of honorary, foreign and associate members.

£120,000 Building Plan

Scottish Agricultural Industries, Ltd., has been granted permission to carry out a scheme of alterations and to erect buildings in Saltpans Road, Ayr, to be used for the storage of fertiliser. The estimated cost of the scheme is £120,000.

Exmoor Iron Mines to Re-open

Planning permission has been obtained to re-open old iron mines on Exmoor, near North Molton, Devon. The mines are said to contain micaceous iron oxide ore used in the manufacture of non-corrosive paints.

PT Relief for Water Heaters

The Treasury has made an order the effect of which is to reduce from 100 per cent to 66⅔ per cent the tax on thermal storage water heaters suitable for operation from electric mains; and to exempt from tax instantaneous water heaters not using bottled gas.

Record Exports

Vauxhall Motors in 1949 exported 57,881 vehicles, 4991 more than in 1948. Total value of exports was nearly £16 million. The best customers were Australia, Belgium, Holland, Scuth Africa, New Zealand, India and Switzerland. Shipments are increasing rapidly to Canada and South America.

Sixty-five Ton Distillation Unit

The Motherwell Bridge and Engineering Co., Ltd., has completed a fractionating tower, weighing 65 tons, 96 ft. long, and 13 ft. in diameter, for the new extension to the Grangemouth refinery. Transportation to the East of Scotland began on December 27. The tower will be one of several on this site, all of which are being fabricated in Scotland.

Coal Production

Deep-mined coal production for the first week of the New Year was about 400,000 tons below the average weekly output last year. Comparative figures are: Last week: 3,724,000 tons (deep-mined 3,536,600 tons, opencast 187,400 tons); week ended January 8, 1949: 3,701,000 (deep-mined 3,607,900 tons, opencast 93,100 tons).

Rubber Testing Conference

A one-day conference on the behaviour and testing of rubber under dynamic conditions is to be held in London on March 17 by the Institution of the Rubber Industry.

Health in Foundries

A report on health and safety standards in Britain's foundries, issued by the Amalgamated Union of Foundry Workers, recommends the setting up of a foundry health research committee, financed by State funds.

Gifts to Leeds University

The recently formed rayon technology department of Leeds University has received an anonymous gift of £40,000. The International Wool Secretariat has made a grant of £2000 to the department of biomolecular structure.

Steel Records Continue

With an ingot output of 491,760 tons during 1949, John Summers & Sons, Ltd. has broken all production records of its steelworks at Shotton. The slab and strip mills and finishing departments have surpassed all previous totals to make possible deliveries of steel sheets and plates totalling 432,117 tons.

Carbonation for Water Treatment

The town council of Ince, near Wigan, is to spend £1000 on a carbonisation plant to neutralise the lime deposits on the town's mains and service pipes. The water, normally very hard, is drawn from artesian wells at Golborne, whose council has asked the Ministry of Health to hold an inquiry into its water supply.

Cellulose Caused Fire

The fire which recently destroyed the factory and offices of E. Greaves & Son (Case Makers), Ltd., Sheffield, was stated by the Sheffield Fire Brigade to have been caused by a spark from a small electric booster for spraying cellulose having ignited vapours given off by the nitrocellulose lacquer.

Laundry Exhibition

The first exhibition for 12 years of the Laundry, Dry Cleaning and Allied Trades will be held at Olympia, London, from September 28 to October 7. All branches of the trade will be fully represented, including starches, soaps, and chemical requisites. Plans are in hand for holding an International Laundry Congress about the same time.

◆ OVERSEAS ◆

Penicillin Millionaire

A penicillin manufacturer is reported to be one of the 28 millionaires in Japan, according to the latest tax returns.

German Steel Below Target

Steel production in Western Germany rose by about 50 per cent last year with a total production 9.026 million tons, but failed to reach the 1949 target—9.6 million tons. Total output in 1948 was 5.92 million tons.

Indonesian Drugs

Claimed to be the first Australian manufacturing enterprise to operate in the new Republic of the United States of Indonesia, Nicholas Pty., Ltd., of Melbourne, Victoria, established a drug factory at Batavia last month. The plant, employing 90 Indonesians, is expected to be in full production within a year.

Australian Steel Prospect

Two U.S. consulting engineers of H. A. Brassert and Company have reported in New York that a small steel plant could be ready to operate in southwest Western Australia in two years, using the Collie coalfields and high-grade ore from Koolan Island. The engineers have been in Western Australia at the invitation of the Western Australian Government.

Canadian Industrial Gases

Manufacturing plants in Canada engaged chiefly in the manufacture of industrial gases in 1948 had a production value of $11.314 million, compared with $9.607 million in the preceding year (+ 17.8 per cent). The chief products were oxygen, acetylene and carbon dioxide. There were 45 factories in operation, 18 in Ontario, 10 in Quebec, four in Alberta, and four in British Columbia.

Rise of Australian Plastics

The rapidly developing plastics industry in Australia estimates that consumption per head of the population in 1949 was 2 lb. Imports during the year (unfinished articles) were valued at £9 million. Reports indicate that the most recent trend is towards large mouldings. A 5000-ton compression press was recently installed in the plant of a Melbourne company. Two 22 oz. injection machines are to raise the already large capacity of a Sydney injection moulding factory.

Swedish Molybdenum

An occurrence of molybdenum ore stated to have an Mb-content of up to 10 per cent is reported to have been discovered in the Bjöstorpa mine in Snavlunda, Sweden.

Europe's Coal Needs

Reduction from 5 million tons in the first quarter of 1949, of the apparent hard coal deficit for Europe, to 1.6 million tons is shown by a recent assessment by the Economic Commission for Europe.

Oil Discovery in Czechoslovakia

Oil has been discovered near Malscky, Slovakia, according to the official news agency. Russian oil experts, who will control the development and disposal of the oil, are said to consider these occurrencies as an extension of the important Austrian oil fields near Zistersdorf.

Decline in Peat Industry

Demand in Finland for peat production which was considerably increased during the war when imported oil derivatives were not available, has declined rapidly and it is reported that 23 enterprises had to go out of business. The chief user of peat has been the Finnish State Railways which have used 80,000 tons per annum.

Phosphate Fertiliser Without H_2SO_4

The Chemical Works, Heinrichshall, Thuringia, East Germany, is reported to be manufacturing phosphate fertiliser without the use of sulphuric acid. Reports in the area state that 50 tons of the product are being made daily. A large works at Rüdersdorf near Berlin, with an annual output of 150,000 tons, is planned to be completed in May. The new process is stated to be capable of saving 56,000 tons of sulphuric acid annually.

Australian Lead Oxides

Production of white lead, which has been scarce in Australia, is being expanded by several new enterprises. A new factory at Cabarita, New South Wales, opened in May last by British-Australian Lead Manufactures Pty., Ltd., has been producing with the Librex process, and the company is replacing an established factory at Port Adelaide, South Australia with a new plant. New factories are also to be established in Queensland, and in Wellington, New Zealand.

Next Week's Events

MONDAY, JANUARY 16

The Royal Institute of Chemistry

Leeds: University, 6 p.m. Prof. W. Q. Kennedy: "Geochemistry."

Institution of Works Managers

Sheffield: Royal Victoria Station Hotel, 7 p.m. A. H. Huckle: "Running a Small Factory."

Electrodepositors' Technical Society

London: Northampton Polytechnic, St. John Street, Clerkenwell, E.C.1. H. Silman and B. E. Love: "Investigations on Protective Black Oxide Coatings on Steel."

TUESDAY, JANUARY 17

Society of Chemical Industry

London: 26 Portland Place, W.1, 6.30 p.m. (Textile Institute and Society of Dyers and Colourists invited). Dr. T. H. Morton (Textile Research Laboratories, Courtaulds, Ltd., Bocking, Essex); "Textile Applications of Synthetic Resins."

Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. W. T. Farmer: "Flour Milling."

Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m. (Electronics Group.) Dr. D. K. C. Macdonald (Clarendon Laboratory, Oxford): "Fluctuations Noise and Recent Developments."

Hull Chemical and Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. W. F. Potter: Presidential address.

Institute of Petroleum

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Annual general meeting. Col. S. J. M. Auld.

Institute of Fuel

London: Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. F. B. Korthauser and G. C. H. Sharpe: "Downjet Coke Firing for Small Steam Generators"; F. F. Ross and G. C. H. Sharpe: "The Burning of Coke by the Downjet Method"; G. C. H. Sharpe: "The Coke-fired Downjet Furnace in Industry."

Ministry of Fuel and Power

Buckingham: Stowe School. Three-day Oil Firing Course. Instruction in most efficient working of a liquid fuel installation and means of obtaining highest thermal results.

WEDNESDAY, JANUARY 18

Society of Chemical Industry

London: 1 Wimpole Street, W.1, 6.30 p.m. (with RIC). A. K. Soper: "The Physical Chemistry of the Gelatin Water System."

Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m. E. W. Golding (British Electrical and Allied Industries Research Association): "Windmills as Electrical Power Generators."

Incorporated Plant Engineers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7 p.m. H. O. Parrack: "Operation and Maintenance of Contracting Plant."

Bristol: Grand Hotel, 7.15 p.m. Commander G. C. T. Turner: "Routine Inspection and Maintenance of Industrial Refrigeration Plant."

Institution of Structural Engineers

Manchester: Reynolds Hall, College of Technology, 7 p.m. (Graduates' and Students' section): "Welded Frames."

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. J. Ward (Technical College, Huddersfield): "Photo Elasticity."

Royal Statistical Society

Newcastle-on-Tyne: Newcastle Chemical Industries Club, 18 Lovain Place, 6.30 p.m. (North-Eastern Group). D. G. Beech: "Graphs and Correlation."

THURSDAY, JANUARY 19

The Chemical Society

London: Royal Institution, Albemarle Street, W.1, 7.15 p.m. Tilden lecture. Prof. M. G. Evans: "Studies on Electron-transfer Reactions."

Hull: University College, 6 p.m. (with Hull University College Scientific Society). Prof. E. E. Turner: "Modern Trends in Stereochemistry."

Manchester: University, 6.30 p.m. (with RIC and SCI). Prof. C. A. Coulson: "Localised and Non-localised Bonds."

Sir John Cass Technical Institute

London: Jewry Street, Aldgate, E.C.3, 6 p.m. First of series of ten lecture-demonstrations. David W. Wilson and F. Holmes: "Microchemical Analysis."

Incorporated Plant Engineers

Liverpool: Radiant House, Bold Street, 7 p.m. T. M. Beeston: "The Plant Engineer's Guide to Steam Costing."

Electrodepositors' Technical Society

Birmingham: Edgbaston, Botanical Gardens, 6.30 p.m. (Midlands Centre). Annual dinner and dance.

Institute of Physics

Birmingham: University, Edmund

Street, 5 p.m., D. A. Wright: "Thermionic Emission."

FRIDAY, JANUARY 20

The Chemical Society

Birmingham: University, Edgbaston, 4.30 p.m. (with Birmingham University Chemical Society). Dr. J. K. N. Jones: "The Separation and Determination of the Sugars and their Derivatives."

Northern Ireland: Belfast, Royal Academical Institution, 7.30 p.m. (with RIC and SCI). J. McG. Jackson: "Chemical Education."

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. (Food and Fine Chemicals Groups). Prof. A. C. Frazer: "Fine Chemicals and the Food Industry."

Oil and Colour Chemists' Association

Birmingham: Chamber of Commerce, New Street, 6.30 p.m. J. A. Waddams: "Mechanism of Certain Photographic Effects of Drying Oil Films."

Institute of Physics

Manchester: University, 7 p.m. J. A. Hall (National Physical Laboratory): "Temperature Measurement."

SATURDAY, JANUARY 21

Institution of Chemical Engineers

Liverpool: (North-Western branch with SCI). A. A. Martin: "Modern Boiler Plant Practice."

Exhibition and Fairs in 1950

United Kingdom.

Manchester: Building Trades Exhibition, City Hall, Deansgate. April 18-29.

London: International Stamp Exhibition, Grosvenor House, Park Lane, W.1. May 6-13.

London and Birmingham. British Industries Fair, May 8-19.

London: Olympia. National Mechanical Handling Exhibition. June 6-17.

London: Earls Court. Industrial Finishes Exhibition. August 30-September 7.

London: Olympia. Laundry Drycleaning and Allied Trades Exhibition. September 28-October 7.

London: Olympia. Brewers' Exhibition, October 2-6.

London: Olympia. Public Works and Municipal Services—Congress and Exhibition.

Overseas.

Copenhagen: Danish Industrial Exhibition. March 17-26.

Utrecht: Royal Netherlands Industries Fair. March 21-30.

Basle: Swiss Industries Fair. April 15-25.

Lyons: International Fair. April 15-24.

Brussels: International Fair. April 29-May 14.

Liege: International Fair. April 29-May 14.

Poznan: International Trade Fair. April 29-May 14.

Hanover: German Industries (Technical) Fair. May 3-14.

Paris: International Trade Fair. May 13-29.

Prague: International Fair. May 14-28.

Toronto: Canadian International Trade Fair. May 29-June 9.

Nairobi: Industrial Equipment and Engineering Fair. June 9-24.

Toronto: 33rd Canadian Chemical Conference and Exhibition. June 19-22.

Chicago: International Trade Fair. August 7-19.

Izmir: International Fair. August 20-September 20.

Ghent: International Fair. September 9-24.

Frankfurt: Autumn Fair. September 17-22.

CHEMICAL LECTURES

Ample Programme for 1950

VARIOUS methods of chemical analysis will be covered in the series of lectures organised by the department of chemistry of the Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C.3. The series forms part of an unusually full programme of information on scientific and industrial topics being offered by several organisations in the next few months.

Spectrochemical analysis is the subject of the first course of 12 lectures by A. S. Nickelson and A. R. Philpotts to be held on Friday evenings, beginning January 13. An introductory lecture will be given by Dr. S. Judd Lewis, and the course will be followed by ten periods of laboratory work (for a limited number of students) on Friday evenings, beginning on April 21.

Microchemical analysis will be dealt with in ten lecture-demonstrations by David W. Wilson and F. Holmes on Thursday evenings beginning on Jan. 19.

Radiochemical methods of analysis will be explained in a course of nine lectures to be given on Tuesday evenings beginning January 17.

At the Polytechnic, Regent Street, London, W.1, the department of chemistry has arranged a course of four lectures on "Advances in the Science and Technology of Synthetic Fibres." The series begins on February 14 and will be held on Tuesday evenings. The lecturer will be Claude Diamond who will cover the scientific and technological aspects.

The Stock and Chemical Markets

BUSINESS in stock markets was on a small scale, reflecting the caution enjoined by rumours of an early General Election. Although selling was only moderate, British Funds fell back sharply, 3½ per cent War Loan to 91¼, Treasury 2½ per cent to 68¼, while 3 per cent Transport was down to 88 and 3 per cent Gas stock 87.

Small declines prevail in the industrial sections at the time of writing, although a rally in industrial shares was considered probable on hopes of a change of Government. Buying interest was meanwhile centred mainly on gold mining, rubber and other shares of overseas companies.

With few exceptions, shares of chemical and kindred companies have not shown movements exceeding more than a few pence, but small declines predominated. Imperial Chemical eased to 42s. 1½d. with the general trend, although there is widespread confidence that the dividend will be maintained at 10 per cent. Monsanto have been firm at 51s. 3d., with Albright & Wilson at 29s. 6d., Boake Roberts 25s. 6d., Brotherton 10s. shares 19s. 3d., F. W. Berk 14s. 3d., Pest Control 8s. 7½d., and Bowman Chemical 5s. 6d., while elsewhere, Laporte Chemicals 5s. ordinary changed hands around 9s. 4½d. The 4s. units of the Distillers Co. remained fairly active around 17s., but following their recent advance, United Molasses came back to 40s. Turner & Newall were active, but at 73s. 9d. have not held all the improvement which followed publication of the full results and the chairman's statement that in future it is not intended to continue restriction of dividends, unless limitation were enforced by law.

Lever & Unilever have been steady at 43s. 9d., but elsewhere, British Aluminium eased to 40s. 6d., and Dunlop Rubber to 61s. 9d. British Xylonite have also been easier at 58s. 9d., British Industrial Plastics 2s. shares lower at 4s. 4½d., and De La Rue 22s. 9d. Glaxo Laboratories 10s. units remained active in their " ex " bonus form, but lost a few pence at 45s. 9d. Boots Drug at 50s. failed to hold best levels, British Drug Houses 5s. ordinary were 6s. 6d., and British Glues & Chemicals 4s. ordinary eased to 18s. 9d., but Blythe Colour strengthened to 27s. 6d.

There was again a firmer trend in iron and steels on the view that nationalisation may never take place. Firth Brown moved up 2s. 6d. to 71s. 3d., Dorman Long were 32s., United Steel 27s. 9d., Stewarts & Lloyds 53s. 4½d., while in other directions, Babcock & Wilcox rallied slightly to 60s. 6d., Guest Keen were 41s. 9d., Staveley 81s., and Powell Duffryn have been at 27s. Borax Consolidated deferred (57s. 3d.) remained firm on expectation of good results because of the company's dollar earning business and interests in the U.S., although it was realised that dividend limitation would prevent shareholders from having a bigger distribution.

Oil shares lost further ground, partly on fears of competition and price-cutting between American and British companies if there is no compromise solution on Britain's decision to reduce oil imports from the dollar areas. A sharp fall in Burmah Oil to 50s. 7½d. followed the removal of the Government guarantee against loss on reconstruction work in Burma. Nevertheless, it is believed in the market that Burmah Oil will be able to maintain its dividend, because of the large investment income from its big holdings in Shell and Anglo-Iranian. At the time of writing, Shell had eased to 63s. 1½d., and Anglo-Iranian to £6⅜.

Market Reports

THERE has been a steady movement in all sections of the industrial chemicals market, with consumers' delivery specifications once again covering good volumes. The flow of export inquiry remains steady, though actual bookings are becoming more and more a question of competitive prices. An active demand continues for most of the soda products and, apart from an advance of 10s. per ton for sodium sulphide and firmer quotations for percarbonate of soda, no important price changes have been notified in this section. The potash chemicals remain in steady call at firm rates. Other items attracting a fair amount of attention include formaldehyde, hydrogen peroxide and bleaching powder. Increased prices have been reported for precipitated barium carbonate and precipitated barium sulphate. The former has been advanced by 30s. per ton and is now quoted at £27 5s. per ton while the latter is £8 per ton dearer at £29 15s. per ton. Due to an increase in the price of zinc all grades of zinc oxide have been advanced by 35s. per ton. Rather quiet conditions persist generally for coal tar products. There is

(*continued overleaf*)

LAW AND COMPANY NEWS

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

British Mineral Corporation, Ltd., London, S.W. (M., 14/1/50.) December 5, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *Nil. November 30, 1948.

Reynolds Scientific Glass Works, Ltd., London, S.W. (M., 14/1/50.) December 1, £2000 (not ex.) charge, to Lloyds Bank, Ltd.; charged on 9 The Broadway, Wimbledon. *£375. April 20, 1949.

Receivership

Mono-Plastic Chemicals, Ltd., 19 Grosvenor Place, S.W.1. (R., 14/1/50.) Mr. Albert A. Henley, of 19/20 Grosvenor Place, S.W.1, ceased to act as receiver and manager on December 14, 1949.

Company News

Change of Name

The company hitherto known as Electronic Transmission Equipment, Ltd., has been re-named Mullard Equipment, Ltd.

Scientific Periodicals

UNDER an agreement between the Academy of Sciences, at Berlin and at Göttingen, and the German Chemical Society, *Chemisches Zeutralblatt* has resumed publication this year. The periodical, which celebrates its 120th anniversary in December, is distributed by Akademie - Verlag GmbH, Schiffbauerdamen 19, Berlin, NW7.

The Society of Chemical Industry starts publication this month of the *Journal of the Science of Food and Agriculture*, to contain papers on original research in food and agriculture that will no longer appear in the *Journal of the Society of Chemical Industry*. It will be issued monthly and review recent work in some branch of food or agriculture.

Physics in Sweden

THE Institute for Nuclear Chemistry in Upsala was solemnly opened on December 8 by Crown Prince Gustaf Adolf, who cordially commended the Nobel Laureate, Prof. T. Sverberg, for his outstanding contributions to science during more than four decades at Upsala University.

The large subterranean cyclotron, which forms part of the institute, is nearing completion. It is being built by the Swedish firm L-K-B-Products in co-operation with the ASEA works and Domnarvet steel works and leading Swedish scientists. Another cyclotron belonging to the Physics Institute of the Royal Academy of Science, just outside Stockholm, is also in its final stages of construction.

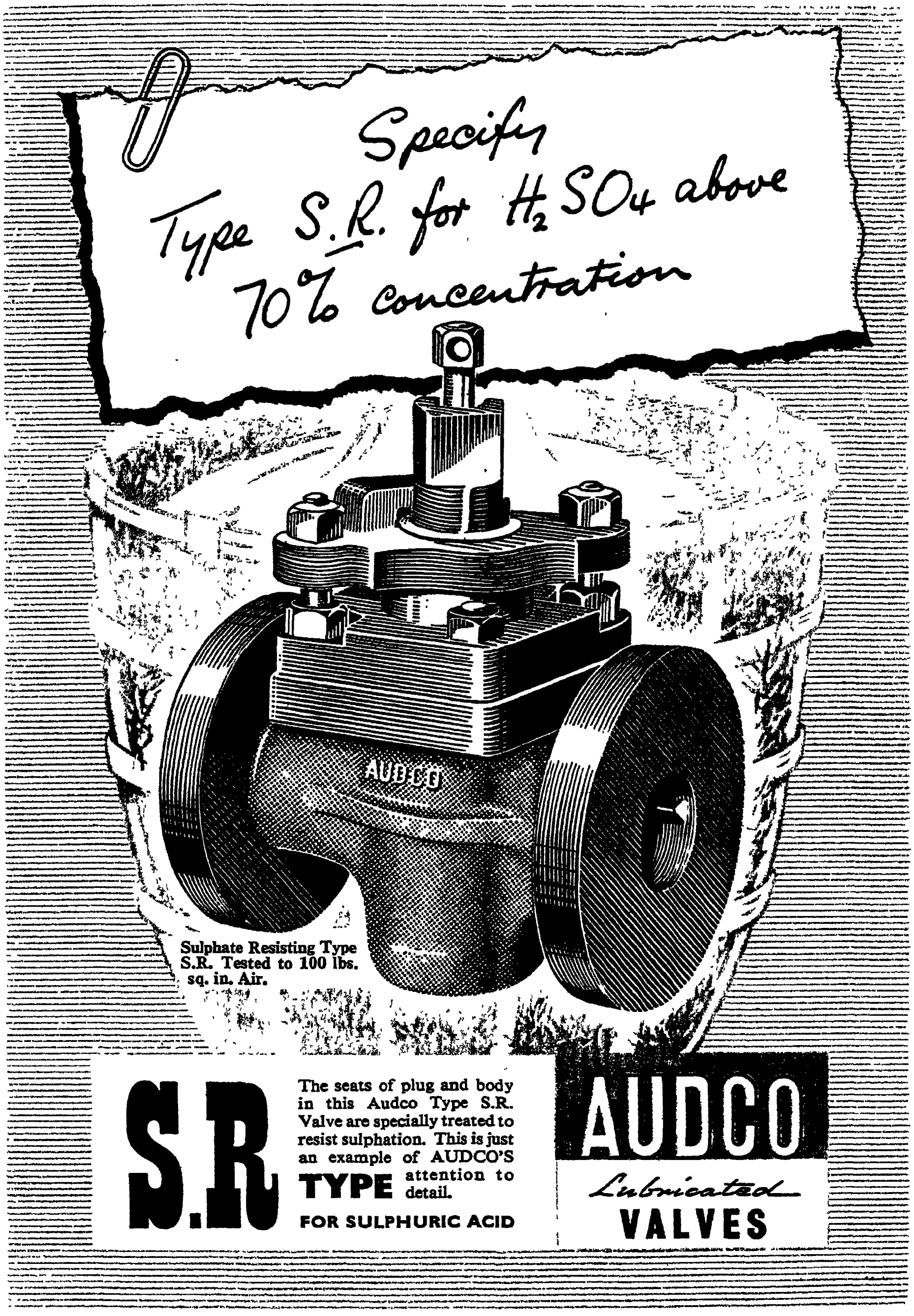
MARKET REPORTS

(*continued from previous page*)

demand for creosote oil and the pyridines. Cresylic acid continues to attract very little interest.

Manchester.—Business on the Manchester chemical market during the past week has been fairly active and is now more or less back to normal. Home-trade users are calling for steady deliveries of soda and potash compounds and a wide range of other heavy chemicals. A reasonably satisfactory weight of new business has been placed by home consumers, as well as by shippings, the latter being mainly for export to Empire outlets. Prices generally remain firm and the sulphides of soda and one or two other chemicals are dearer. The market for fertilisers and for tar products has also been busier.

Glasgow.—A number of Scottish works have been closed the whole week for the New Year Holidays and all have been closed for part of the week. The turnover at this time of the year is very small. The export market has been a little more active, particularly with heavy inquiries for trisodium phosphate, for which the earliest shipment is now 4-5 months, as a result of heavy bookings.



Sulphate Resisting Type S.R. Tested to 100 lbs. sq. in. Air.

S.R TYPE

The seats of plug and body in this Audco Type S.R. Valve are specially treated to resist sulphation. This is just an example of AUDCO'S attention to detail.

FOR SULPHURIC ACID

AUDCO

Lubricated

VALVES

AUDLEY ENGINEERING CO. LTD., NEWPORT, SHROPSHIRE, ENGLAND

STABLE GAS CONTAINER

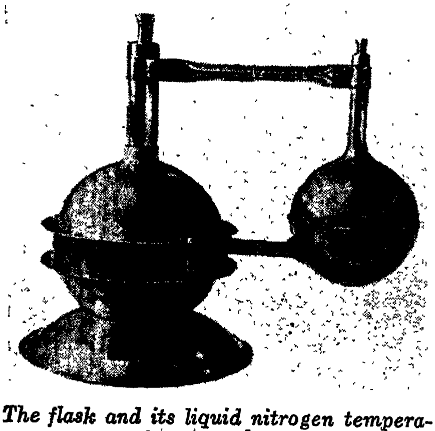
Low Temperature Storage Device

A STEP towards solving the problem of storing under stable conditions liquid hydrogen and liquid helium is the production in the U.S.A. of a container for storage and transport, which is expected to encourage wider use of the gases.

The Hofman Liquid Hydrogen Container, for which United States Patent No. 2,453,946 has been granted (Hofman Laboratories, Inc.), employs three concentric copper spheres. The inner and outer spheres form a conventional vacuum flask, with facing interior surfaces polished to a mirror-like finish. Between them is placed a third sphere, highly polished on both sides, which acts as a radiation shield. This shield is attached by a unique connection to the inner sphere of a smaller side flask of liquid nitrogen.

Liquid hydrogen boils at —254° C., so that it rapidly returns to the gaseous state even in a conventional vacuum flask. The new container greatly limits this action by providing a cold barrier in addition to vacuum insulation and reflecting surfaces. The radiation shield of the main flask is cooled by conduction to the temperature of the liquid nitrogen in the side flask. Evaporation losses of liquid hydrogen (or helium) in storage and handling are said to be reduced to a negligible amount. The principle has been exhaustively tested, with good results.

The containers are being made in 10, 25, and 50 litre capacities with side flasks holding 5, 15, and 25 litres.



The flask and its liquid nitrogen temperature regulator

DIEPOXYHEXANE

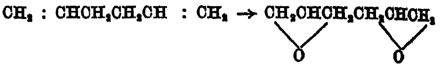
New Derivative of Diallyl

DIALLYL can readily be made by the action of a metal on allyl chloride.

$$CH_2 : CHCH_2Cl + Mg + Cl\,CH_2\,CH : CH_2 \rightarrow CH_2 : CHCH_2CH_2CH : CH_2 + MgCl_2$$

Diallyl or 1: 5 hexadien appears to offer considerable possibilities as an intermediate in syntheses, particularly of long chain compounds. But an unusual reaction of one of its derivatives diepoxyhexane has lately been reported; in this case instead of forming long chain compounds it forms a closed ring.

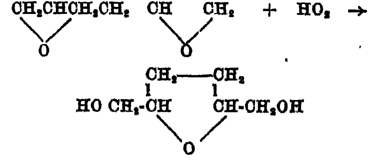
According to D. J. C. Wood and L. F. Wiggins (*Nature, 164,* 402, 1949), diallyl can be converted to 1: 2-5: 6-diepoxyhexane by treatment with perbenzoic acid; the yield is 80 per cent.



Diallyl Diepoxyhexane

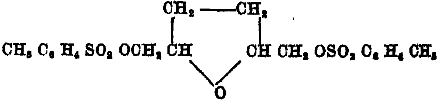
The epoxide rings are easily hydrolysed, *e.g.*, by boiling with water. It was expected that the product which would be formed would be 1,2,5,6-tetrahydroxyhexane.

In practice this reaction did not take place. Instead, only one molecule of water was taken up, ring closure occurred and 2: 5-*bis*hydroxymethyl tetrahydrofuran was formed in 65 per cent yield.

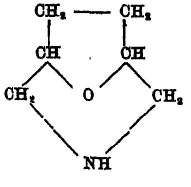


Diepoxyhexane 2:5-*bis*hydroxymethyl tetrahydrofuran

This substance formed a crystalline (m.p. 114-118° C.) *p*-toluene sulphonate



and when this was treated with methyl alcoholic ammonia an imine was formed which had the constitution



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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Splicing of organic mono-filaments.—Firestone Tire & Rubber Co. June 20 1946. 633,082.

Process for the production of dibasic carboxylic acids.—E. I. Du Pont de Nemours & Co. Nov. 30 1945. 633,354.

Resinous compositions comprising amino-formaldehyde condensation products.—British Industrial Plastics, Ltd. Jan. 12 1946. 633,356.

Separation of gaseous and gas-and-vapour mixtures.—American Magnesium Metals Corporation. May 18 1940. 633,137.

Production of side-chain chlorinated methyl naphthalenes.—Petrocarbon, Ltd., H. S. Boyd-Barrett, J. R. Holker, and H. M. E. Steiner. Feb. 24 1947. 633,097.

Process for preparing complex organic compounds of antimony.—E. A. H. Friedheim. April 9 1946. 633,370.

Compositions of matter comprising anacardic phenols, aldehydes and aniline, and their inter-reaction products.—British Resin Products, Ltd. May 1 1946. 633,143.

Process and apparatus for dispersing an aeriform body in a liquid body.—L. E. Jones. (Shawinigan Chemicals, Ltd.). May 16 1947. 633,378.

Processes and apparatus for the treatment of hafnium, zirconium, titanium, thorium and their alloys in the molten state.—W. J. Kroll. April 7 1947. 633,117.

Methods of preparing 2-ethyldibenzofuran.—British Thomson-Houston Co., Ltd. June 13 1946. 633,151.

Cellulose ether compositions.—British Celanese, Ltd. June 14 1946. 633,152.

Hydrogenation of cashew nut shell liquid.—Harvel Corporation. March 21 1945. 633,165.

Manufacture of copperable polyazo dyestuffs.—J. R. Geigy A.G. Aug. 2 1946. 633,166.

Methods of recovering silver from residues containing the same.—British Thomson-Houston Co., Ltd. Aug. 7 1946. 633,119.

Silencing of gaseous currents.—Silto Soc. Anon. Nov. 21 1946. 633,120.

Antibiotic preparations and process for obtaining the same.—Parke Davis & Co. Sept. 3 1946. 633,175.

Production of aromatic aldehydes.—E. I. Du Pont de Nemours & Co. Aug. 24 1946. 633,176.

Vitreous enamels and compositions for use in the preparation of the same.—C. E. Every. Aug. 27 1947. 633,178.

Production of aldehydes.—I.C.I., Ltd., A. W. C. Taylor, and G. Turner. Oct. 13 1947. 633,184.

Precipitation and filtration of gold and silver from cyanide solution.—Huntington, Heberlein & Co., Ltd. (E. N. H. Molloy). Oct. 22 1947. 633,203.

Process for the manufacture of copper-containing azo dyestuffs.—Sandoz, Ltd. Dec. 13 1946. 633,206.

Process for the manufacture of vinyl chloride.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 17 1946. 633,211.

Azo pigments.—I.C.I., Ltd., J. Glassman, and D. T. Sarfas. Dec. 10 1947. 633,215.

Process for the manufacture of 2-amino-6-hydroxy-8-(hydroxymethyl)-pteridine.—Roche Products, Ltd. Feb. 3 1947. 633,227.

Production of thiophene.—Socony-Vacuum Oil Co., Inc. Sept. 28 1944. 633,239.

Production of alkyl derivatives of thiophene.—Socony-Vacuum Oil Co., Inc. Sept. 29 1944. 633,240.

Process for the manufacture of 5, 6, 7, 8-tetrahydroisoquinoline. — Roche Products, Ltd. Feb. 12 1947. 633,266.

Removal of sulphur dioxide from gases.—Simon-Carves, Ltd., Mayor, Aldermen and Councillors of the Metropolitan Borough of Fulham, W. C. Parker, and E. W. F. Gillham. Aug. 26 1946. 633,627.

Purification of sugar solutions.—A. H. Stevens. (American Cyanamid Co.). Sept. 19 1946. 633,552.

Process of neutralising acid, phosphate-containing solutions of calcium nitrate.—Directie Van De Staatsmijnen in Limburg. June 12 1945. 633,699.

Strong, homogeneous, coherent coatings and self-sustaining films and method of forming same.—B. F. Goodrich Co. Nov. 30 1943. 633,630.

Recovery of acetone, ethyl alcohol and butanol from their acqueous solution by distillation.—Commercial Solvents (Great Britain), Ltd., H. N. Darlington, and H. Holdsworth. Nov. 25 1946. 633,706.

Production of compounds containing the isoprene grouping.—L. E. Jones. (Distillation Products, Inc.). Dec. 24 1946. 633,711.

Special Announcement

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Manufacture of silica gel-containing catalysts.—C. Arnold. (Standard Oil Development Co.). Jan. 28 1947. 633,635.

Method and apparatus for the production of gas suitable for chemical synthesis.—Soc. Anon. Forni Ed Impianti Industriali Ingg. De Bartolomeis. June 10 1943. 633,718.

Processes for preparing alkyl aryl ketones and the alkyl aryl resulting therefrom.—Monsanto Chemical Co. June 26 1946. 633,724.

Process for producing para-vinylbenzyl acetate, paravinylbenzyl alcohol and polymers and copolymers thereof.—Monsanto Chemical Co. June 22 1946. 633,727.

Dealkylation of polyalkyl alicyclic ketones and alcohols.—Standard Oil Development Co. June 27 1946. 633,434.

Process for producing para-acetylbenzyl acetate para-(alpha-hydroxethyl) benzyl acetate and para-(alpha-acetoxyethyl) benzyl acetate.—Monsanto Chemical Co. June 22 1946. 633,435.

Demulsifying compositions.—American Cyanamid Co. May 8 1946. 633,644.

Processes of preparing isopropenyldiphenyl and the products resulting therefrom.—Monsanto Chemical Co. Jan. 20 1945. 633,646.

Methods of preparing resinous condensation products and the compositions resulting therefrom.—Monsanto Chemical Co. June 12 1946. 633,438.

Methods of drying gelatine layers.—N.V. Philips' Gloeilampenfabrieken. June 1 1946. 633,731.

Production of organohalosilanes.—Dow Corning Corporation. June 6 1946. 633,732.

Production of oxazolone derivatives.—Ilford, Ltd., J. D. Kendall, and G. F. Duffin. June 11 1947. 633,736.

Protection of magnesium and magnesium base alloys against corrosion.—Magnesium Elektron, Ltd. June 13 1947. 633,653.

Preparation of 2-amino-4-hydroxy-6-methyl pryrimidio (4, 5-b) pyrazines.—American Cyanamid Co. July 27 1946. 633,656.

Compositions comprising plastic polymerised chloroprene.—B.B. Chemical Co., Ltd. Jan. 31 1940. 633,745.

Process for the manufacture of N-(p-arsenosobenzyl)-glycineamide and salts thereof.—Roche Products, Ltd. Nov. 27 1946. 633,459.

Electrodeposition of zinc and anodes for use therein.—Hudson Bay Mining & Smelting Co., Ltd. Aug. 7 1941. 633,468.

Manufacture of sulphur.—Anchor Chemical Co., Ltd., R. Darlington, V. Oakes, and K. C. Roberts. Nov. 1 1947. 633,469.

Production of organic fluorine compounds.—I.C.I., Ltd., H. R. Leech, and R. Le G. Burnett. Nov. 17 1947. 633,678.

Catalysts.—I.C.I., Ltd., and P. W. Reynolds. Dec. 5 1947. 633,531.

Process for synthesising vinyl esters of carboxylic acids.—Soc. Belge De l'Azote et Des Produits Chimiques Du Marly. March 21 1944. 633,681.

Preparation of sodium thiosulphate for testing water.—A. H. Cox Co., Ltd., W. Killner, and D. C. Ford. Jan. 14, 1948. 633,533.

Apparatus for separating and removing liquid and other impurities from gaseous fluid under pressure.—Superheater Co., Ltd. (Superheater Co.). Jan. 23 1948. 633,607.

Apparatus for electrolysis.—Laporte Chemicals, Ltd., C. O. Bishop, and H. L. Hulland. Feb. 17 1948. 633,541.

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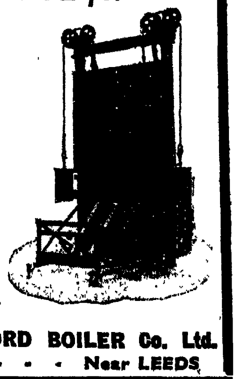

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The Election

BEFORE we are thoroughly involved in the rough and tumble of a General Election it is good to pause to take a glance at the general situation and strive to formulate a sensible line or policy. All the political parties are so engaged, but the task should not be left to them. The business man and citizen who professes no particular enthusiasm for parties should also take his bearings and endeavour to visualise the needs of the situation as he sees them (writes Sir Ernest Benn).

The political candidate who carries on the disastrous game of mass bribery, and asks the people to continue to believe that votes can perform the impossible, is deliberately doing his share in the further degradation of our public life. We have completed five years in which Socialism has held full power, but few thoughtful men have so limited a vision as to believe that the decrepit condition of the body politic and economic is entirely due to what has happened in five years. The blame must be shared by all political parties which have led the unsuspecting to attach a cash value to the franchise. One way and another, we have reached a wholly unprecedented position—£4000 million of annual public expenditure. It must be assumed that the vast obligations represented by this figure have been undertaken in the interests of all, and that all share in services costing £6 per week per family.

On February 23 the worker will have the opportunity of showing how far he understands what has happened, and how far he is satisfied with the value received for a sum as large or larger than he himself is able to earn and spend. The money is poured out for purposes he nominally has approved, but his control in the matter is, admittedly, extremely remote. Seeing that the Socialists are about to celebrate the first 50 years of their party life, it is not out of place to remind ourselves that this £6 per week per family, for all the purposes of government, is the modern counterpart of the 3s. per week per family with which Salisbury and Gladstone did everything that any Government up to that time had ever done. With that they put John Bull on the very top of the globe. Now, while spending £4000 million, and enjoying what is so curiously called full employment and " security "—in

On Other Pages

Leader:
The Election . . 113
Notes and Comments:
Technology in Universities . . 115
Differing Functions . . 115
Better Liaison . . 115
Two Nations' Instruments . . 116
Coconut Boom . . 116
Chemicals Aid Trade Recovery . . 117
Dutch and Belgian Progress in Antibiotics . . 118
Post-Graduate Technology . . 119
Sulphuric Acid Control to End . . 119
Chemical Materials in October and November . . 120
National Rubber Prospects . . 121
Dollars for French Industries . . 121
A New Detergent . . 122
Norwegian Whale Oil . . 122
December Steel Output . . 122
U.K. Trade in December . . 122
Drugs and Fine Chemicals in 1949 123
Chlorine in Aluminium - Paper Laminates . . 126
Plant Heating Developments . . 127
Improving Thermal Efficiency . . 129
Printing Ink Technology . . 130
Chemistry Education in Spain . . 132
Improved Containers Design . . 133
New Departments of the Board of Trade . . 134
Lithopone Freed from Control . . 134
Expanding Capacity in S. Africa . . 135
Gas Leak Detector . . 140
Slow Development of Spanish Fertiliser Industries . . 145

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

a world where no such thing exists, we are still running into debt on import and export account, in dollars and other currencies, to the tune of nearly £10 million a week.

The need for repeal, retrenchment and reform is obvious. Whether a people taught to look to the State to ensure their livelihood are ready for such a policy is admittedly in doubt. The word "repeal" is too little in favour, perhaps because of the existence of the powerful vested interest in bureaucracy which prefers the complications of amendment. Here, however, is a practical point on which more insistence should be laid. The past five years have seen more legislation than any previous time; measures have been rushed through the House of Commons, sent to committees which were never intended to deal with questions of high policy, put through these same committees by the force of the guillotine and incorporated in the Statute Book before anybody but their bureaucratic authors had had time to digest them. It is quite inconceivable that this enormous mass of new and experimental law can all be of the needful quality. Some of it is ill-conceived and deliberately harmful.

The businesslike method with much of this would be straightforward repeal and, after due consideration, the reintroduction as new legislation of anything worthy of being retained. The evidence for this can be seen in the latest Town and Country Planning Act, under which it is unlikely that any individual will ever again take the risk of laying one brick upon another. Such simplification as only repeal can achieve is shown to be essential by the recent offer of the Stationery Office, for 65 gns., of 35 volumes of departmental orders, rules, and regulations, under which we are supposed to carry on our business and conduct our lives. That simple fact, which makes a mockery of all our vaunted freedoms, should warn us against the habit of amendment, which only means that these orders, most of them already incomprehensible to the lay mind, will become worse confounded, and act as a further discouragement to a people who need nothing more urgently than the feeling of liberty to move.

Retrenchment is the short, simple and complete answer to inflation, and if put forward in that way should make a strong appeal to a people living under a threat which few can fail to understand. The situation really calls for a liquidator to handle a problem

(*continued on page* 116)

Notes and Comments

Technology in Universities

TECHNOLOGY and applied science are liable to occupy the status of poor relations in the university curriculum. That at least is a theory to which a good many people will subscribe who knew the pre-war university better than the contemporary one. That theory, however, now seems to have been thoroughly discredited by the latest statement of policy by the University Grants Committee whose influence on university values is anything but negligible. This pronouncement represents the highly informed opinion of a technology subcommittee of 13 under the chairmanship of Dr. A. E. Trueman composed of people of the calibre of Sir Charles Darwin, Mr. H. W. Cremer and Sir Charles Ellis, whose recommendations to place technology studies on a firmer, expanding basis in universities appear to have received the ungrudging support of the Grants Committee. This growth, as the latter committee observes, has acquired most of its vigour since the war. In 1938-39 there were 5288 students of applied science in the universities: today there are 10,916, excluding those studying chemistry and physics in preparation for entry into industry.

Differing Functions

IT is clearly the intention of the Grants Committee to open the gates considerably wider, without allowing any lowering of the standards as a concession to expediency. If these opinions receive the respect they deserve it may be expected that gradually there will be a clearer demarcation of the teaching responsibilities in this regard of the universities and the technical colleges, which should simplify and invigorate the performance of both. Applied science and technology in universities will be more widely based on higher standards of fundamental science and contain a smaller element of training concerned with immediate work in industry. Some overlapping in the colleges and universities is unavoidable, but this clearer definition of functions should greatly improve the prospect of a more ample supply of technologists of two kinds—those who are urgently needed now, especially in chemical engineering, and men with the wider background, fitted to grapple with the unfamiliar problems which will emerge as changes occur in industrial objectives.

Better Liaison

THE desirability of bringing people together for mutual enlightenment is recognised today in all strata of the community, and chemical industries have certainly not been backward in establishing the merits of the principle. It is encouraging to note that the same idea in several forms has been the basic motive of an important proportion of the work during the past year of the Chemical and Allied Trades Section of the Manchester Chamber of Commerce. The work of the section in promoting the exchange of information by personal contacts between producers and users of chemicals is typical of the very practical outlook of the Manchester chemical group. Chemical users can be divided into a great number of classifications, but all are capable of giving and receiving some data which will heighten the economical use and effectiveness of the chemicals produced for home industries. That, indirectly, lends force in more ways than one to the endeavours to enlarge the export trade. The fact that very few chemicals are now cheap has not ruled out the possibility that several of them are still being used to some extent ineffectually, either because of comparative unsuitability or of limited knowledge of their full potentialities. The laundry industry, which the Manchester group has singled out for liaison work, is certainly not the least knowledgeable of industrial chemical users; but in view of the comparative novelty of some current practices in detergency and the number and bulk of chemicals which a modern laundry uses, the talks should provide real benefits to the chemical industries around Manchester and to the British Launderers' Research Association, whose collaboration has been sought.

Two Nations' Instruments

FULLER opportunities than commonly offer to see the advances which 1949 has yielded in the department of scientific instrument technology will materialise early this year at two exhibitions to be held in London. The 34th annual exhibition by the Physical Society at the Imperial College of Science and Technology (March 31 to April 5) is to have a longer lease of life than its counterpart in 1949, and once again some of the entries in the craftsmanship and draughtsmanship competition for apprentices and learners will be on view to indicate what sort of standard of performance in the fundamentals is being maintained by the next generation of instrument makers. French scientific circles are responsible for the other exhibition to be held from February 9-26 at the Science Museum, South Kensington—possibly a return for the successful example of international scientific co-operation set by the Davy-Faraday exhibition organised by the British Council and held in Paris in 1948 (THE CHEMICAL AGE, 59, 183). Exhibits will give British scientists a view of instruments for physical research, photography, medical physics, chemistry, and civil and mechanical engineering. The display is under the patronage of the Cultural and Commercial Counsellors to the French Embassy and will represent the work of the Centre National de la Recherche Scientifique, the Office National d'Etudes et de Recherche Aeronautique, the Commissariat a l'Energie Atomique and a number of scientific instrument manufacturers. That assures that it will be fully representative of recent French achievement, the picture of which will be filled in by papers by some of the French authorities.

Coconut Boom

THE fact that some vegetable oils continue to command one of the few remaining sellers' markets was proved with disconcerting results in Ceylon about a week ago. The boom in coconut products, copra rising to the unprecedented level of Rs.185 per candy, which took effect almost as soon as the United Kingdom long-term buying contract came to an end, attested how urgent is the demand for edible oils. The Colombo authorities can scarcely have foreseen how startling would be the effect of establishing a free market for one of the island's principal sources of revenue. It produced, among other things, a crisis in the coconut oil milling and associated industries, a large proportion of which closed down rather than pay the free market prices. The Government, faced with the probability that it might not be able to fulfil its own contract to supply to 10,000 tons of coconut oil and the likelihood that Ceylon processers would lose their markets, hastily banned all further exports of coconuts and copra. Our Colombo correspondent, who sends this evidence of the scramble which can result at the breakdown of a long term of Government regulated commerce, has not indicated how the U.K. Ministry of Food has fared in this coconut crisis. Canada has already indicated the possibility of doubling her purchases of Ceylon coconuts and products.

THE ELECTION

(*continued from page* 114)

that is not uncommon in the industrial world—the problem of over-trading. If a liquidator could first of all repeal a few of these 35 volumes of orders, next reduce the rest to a sound economic basis, then the road would be clear for such reforms as a sadder, wiser and chastened people would demand. What is quite certain is that any political party lending itself to further promises of ease, wealth, leisure or comfort, is doomed to a very short life and a discredited end.

CHEMICALS AID TRADE RECOVERY

Manchester Group Surveys Recent Factors

THE sustained interest of the Manchester Chamber of Commerce in all sections of the chemical industry was well illustrated in the annual report of its Chemical and Allied Trades Section, presented at the recent meeting, at which Mr. T. C. Fawcett (General Chemicals Division, I.C.I., Ltd.) presided, and was re-elected chairman.

The report pointed out that 1949, above all years, was one calling for increased production from all sections of industry, and in consequence it was necessary for the chemical industry to meet heavy demands for its many products needed in the manufactures of the country. These demands were met with great success and the industry could take pride in observing the increased figure of national exports, since it could justly be claimed in respect of the majority of other manufacturing industries that some important chemical product had played its part in the creation of their goods.

Nor had the chemical industry slackened in its own direct export efforts as the official monthly figures (published regularly in THE CHEMICAL AGE) revealed. The industry's efforts to assist in bringing about our national recovery was further emphasised by a substantial reduction in the figures relating to chemicals, etc., imported into the country.

These results had been achieved in spite of many difficulties which still prevented full development of the industry's potential output, not the least of which had been the continued restriction of capital expenditure. Many projects envisaged to increase the industry's capacity had, in the national interest, had to be postponed or reduced in scale.

Shortage of Trained Personnel

The committee had met regularly throughout the year and had had under consideration several matters of importance to members of the chemical section. A long standing problem which came before the committee was the shortage of suitably trained technical personnel for entrance into the industry. It was felt that much might be done to improve the situation by assisting university graduates to co-ordinate their university training with current needs of industry. This theme was developed in discussions between members of the committee and the secretary of the Manchester University Appointments Board, and at a meeting of the chamber's board of directors.

As a result of these discussions, action would be taken in the near future to stimulate greater interest among members of the section in the scheme conducted by the appointments board, under which students obtained employment with manufacturers during the summer vacation.

The chemical industry had continued to achieve a high level of exports and since in so many cases this trade was dependent upon quantities permitted under bi-lateral agreement negotiated between the U.K. and other countries, negotiations for such agreements and their operation had been kept under close review.

Overseas Inquiries

Evidence of the growing interest shown by members in the export trade was revealed by the increased number of inquiries received during the year by the trade inquiries and tariff departments of the chamber. These departments had been of special help to members in connection with agencies, licensing and tariff matters.

The announcement in September of sterling devaluation gave hope of increased exports to the markets of Canada and the U.S.A., and there was evidence of the industry's intention to take full advantage of the changed situation. When the Export Credits Guarantee Department announced new facilities to stimulate trade with these markets, many members of the chemical section were present at a meeting called by the chamber when the district manager of the Government department gave details of the new cover to be made available.

In connection with the consideration of export trade matters, the committee had maintained a close watch on the revival of competition from former enemy countries, and the situation had been examined from time to time during the year in an endeavour to ascertain to what extent these countries, particularly Germany, were re-entering overseas markets.

Examples had been produced of the re-emergence of Germany as a competitor in the field of chemicals, but although prices quoted were now causing some anxiety in home circles, exchange problems had so far prevented the full impact of their effect. The matter was one which the committee would continue to observe closely, and should the need arise all possible measures would be taken to protect the interests of members.

It was regretted that the year had not seen the abolition of purchase tax in respect of drugs and medicines sold under a proprietary name or trade mark. Members would recall that this had been the subject of representations to the Chancellor of the Exchequer during 1948, and it had been hoped that the 1949 Budget would see the end of this anomaly. Such was not the case, however, and manufacturers of proprietary brands continued to incur the burden of tax on their products.

The committee would continue to keep this matter under review in the belief that it was not in the best interests of the industry that the user of a registered brand or name—in most cases a guarantee of quality and purity—should suffer differentiation in the matter of purchase tax.

During the year, the committee had given careful consideration to the need for improved liaison between users of chemicals and chemical manufacturers. Particular thought was given to the case of launderers, who it was felt in some cases were not taking advantage of chemical products likely to be of the greatest use in their business. An approach had been made to the British Launderers' Research Association.

The committee had maintained friendly contact with other sections of the chamber on problems of mutual interest to members of those sections and of the chemical industry.

A valuable contribution towards increased productivity was also reflected in the annual report of the finishing and allied trades section of the Manchester Chamber of Commerce.

In the third quarter of 1949, the dyeing and printing sections attained 83.5 and 76.4 per cent respectively of the 1937 output, compared with 72.6 and 60.8 per cent in the same period of 1948.

Consideration was given to the long-standing problem of the wrongful application of the term " fast colour " to fabrics not dyed by vat colour processes.

Following discussions between the chamber's textile exporters' committee and representatives of the Cotton and Rayon Merchants' Association, members were advised that the considered view of both organisations was that they should not be a party to abuse of the term fast colour, and that the use of fastness labels in the case of goods not dyed in vat colours was to be deplored.

The use of the expression " commercially fast " when placing contracts with dyers was also to be deprecated. Such an expression was not recognised in the trade.

Dutch and Belgian Progress in Antibiotics

PRODUCTION of amino salicylic acid of high purity (for use against many forms of tuberculosis) is reported to have been developed by the Brocachemie of Zaandam, a subsidiary of the pharmaceutical manufacturers Brocades-Stheeman and Pharmacia which specialises in the preparation of organic chemicals.

Equipment—writes our Amsterdam correspondent—is being improved to step up the output of this product, which should ultimately be sufficient to meet all Holland's home requirements.

Production of antibiotics in Holland, particularly penicillin, is reported to have developed more slowly than was hoped, although the Nederlandse Gist en Spiritus, Ltd., is a fairly large producer in Holland and in Belgium.

Belgium, indeed, appears to be giving more attention to antibiotics. A factory is shortly to be erected at Genval, province of Brabant, for making penicillin and streptomycin. It is claimed that processes involved will be less expensive than those used in the U.S.A. although it is not revealed in what respect they differ from the American methods. The Brussels authorities appear to be willing to afford considerable protection to this venture.

The new five-storey factory now being constructed by Imperial Chemical Industries, Ltd., at the Wijnhaven-Leuvehaven port of Rotterdam, is expected to be completed by the end of next June.

A wool-like fibre derived from milk is reported to have been successfully produced by the co-operative dairy Friesland as a result of research undertaken on behalf of all Dutch dairy co-operatives.

Fisons' New Interest

On the retirement of Mr. F. G. Marshall, the business of Julius Hülsen & Co., Newcastle-upon-Tyne, has been acquired by Fisons, Ltd., of Ipswich. The responsibility for sales of blanc fixe and sulphate of ammonia, both products of Fisons' works at Blaydon-on-Tyne, now rests with Whiffen & Sons, Ltd., Fulham, S.W.6.

POST-GRADUATE TECHNOLOGY

Closer Integration of Industry and the Universities

THE close association of technology with fundamental science is essential if technology is to figure at all in the university system. This appears to be one of the main conclusions reached by a sub-committee on technology of the University Grants Committee in a recent note to the Treasury.*

The aspects of technology appropriate to universities and technical colleges are not the same, it is maintained, though they may overlap to some extent.

It would be generally agreed that the work of a university in technology should be much more closely related to fundamental science or other relevant studies than that of a technical college. In general, the courses should be more widely based on higher standards of fundamental science and contain a smaller element of training related to immediate or special work in industry, the sub-committee recommends.

Happy Compromise

British universities had adopted a policy of compromise between the system common in a number of Continental countries, where technology does not appear in the universities, and the American system, where (in the almost complete absence of technical colleges) a great range of work, both in technology and in technical studies, finds its place in the universities. This compromise had been often criticised, and, at first sight, it might appear advantageous to bring the whole field of technology within a single group.

It was, however, good for the whole university that technologists should form part of the student body, the report observes, and it was essential for the well-being of industry that some of their technologists should have been educated in universities, in contact with students drawn from a wide variety of faculties. If all students of higher technology were placed in the universities the numbers would, of course, be so disproportionate that many advantages would be lost.

The normal undergraduate in applied science gained greatly from having some industrial experience at an early stage in his career; the sub-committee therefore approved the arrangements of many universities for providing industrial experience during vacations, which were being extended wth the co-operation of industrial firms.

Post-graduate activities in the field of technology should certainly be extended to include some instruction, as distinct from research. Further facilities for such studies were urgently required and these could be provided in a reasonably short time at a number of universities. They should make provision both for graduates in applied science and for good honours graduates in pure science, in order that a flow of men of varied basic training might be available for technological posts in industry.

Aid from Industry

For graduates in technology, though not for those in pure science, such post-graduate study should follow a period of not less than two years in industry.

The difficulties raised by such a proposal were obvious. Provision of support for the student was essential and some industrial organisations would no doubt be willing to maintain men during this special training; but in other cases it would be necessary to provide assistance from public funds.

It was visualised that provision for some 250 men a year should be made, but this number might be increased when it was possible to make a more accurate estimate of the demand.

Post-graduate courses of one or two years' duration were recommended, such as those successfully instituted at some of the universities.

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* A Note on Technology in Universities (HMSO, 4d).

Sulphuric Acid Control to End

A BOARD of Trade announcement this week confirms that control by the board of sulphuric acid will end on January 31.

Thereafter the National Sulphuric Acid Association will act as the board's agents in respect of certain functions hitherto performed by the control, in particular the import and distribution of raw materials for the manufacture of sulphuric acid.

From February 1, inquiries, etc., hitherto sent to the control should be addressed to the National Sulphuric Acid Association, Ltd., at 166 Piccadilly, London, W.1. If these are within their functions as agents for the board, the association will advise. Other matters will be referred to the Board of Trade.

Chemical Materials in October and November

Little Change in Production, Consumption and Stocks

LEVELS of production, consumption and stocks of basic chemicals remained fairly steady in October, 1949. Production of molasses showed a marked increase over the previous month and over October, 1948, while consumption of liming materials again rose well above the figures for September and those of October, 1948.

Estimated numbers of employed in the chemical and allied trades in October (in thousands) reached 444.1 an increase of 3.1 over the total for the previous month. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc. 255.2 (186.2 men, 69.0 women); paints and varnishes 38.3 (26.9 men, 11.4 women); oils, greases, glue, etc., 66.7 (53.1 men, 13.6 women); pharmaceutical, toilet preparations, etc. 83.9 (42.0 men, 41.9 women).

These figures and the table given below are abstracted from the *Monthly Digest of Statistics*, No. 47 (HMSO, 2s. 6d.).

	October, 1949 Thousand Tons			October, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	140.0*	144.0	—	133.8*	136.0	—
Sulphur	—	27.0*	87.6*	—	24.0*	66.1*
Pyrites	—	18.7*	68.0*	—	19.5*	66.0*
Spent oxide	—	15.7*	178.4*	—	16.7*	166.8*
Molasses (cane and beet)	70.9	31.1†	246.8	53.2	30.7†	233.1
Industrial alcohol (mil. bulk gal.) ...	2.23	2.87	3.27	2.15	2.84	8.96
Superphosphate	19.0	19.1	—	17.5	19.5	—
Compound fertiliser	164.2	122.8	—	147.1	121.1	—
Liming materials	—	774.1	—	—	526.6	—
Ammonia	—	6.82*	5.73*	—	6.77*	5.76*
Nitrogen content of nitrogenous fertilisers	20.04	19.85	—	20.52	20.76	—
Phosphate rock	—	96.5	218.9	—	89.5	180.3
Virgin aluminium	2.24	15.2	—	2.41	14.5	—
Virgin copper	—	28.3	143.9	—	31.3	120.8
Virgin zinc	—	18.2	65.1	—	18.3	55.4
Refined lead	—	15.8	61.9	—	18.1	13.6
Tin	—	2.24	22.5	—	2.01	17.8
Zinc concentrates	—	13.9	74.0	—	12.9	30.0
Magnesium	0.46	0.30	—	0.33	0.41	—
Pig iron	187.0*‡	189.0	495.0*	185.0*	137.0	274.0*
Steel ingots and castings (including alloys)	315.0*‡	—	1,296.0	303.0*	—	1,006.0
Rubber: Reclaimed	0.43‡	0.43‡	2.63	0.43‡	0.43‡	4.25
Natural (including latex) ...	—	0.42‡	44.7	—	4.68‡	62.6
Synthetic	—	0.05‡	1.37	—	0.05‡	2.16

* November. † Distilling only. ‡ Average of five weeks.

The October figure for sulphur stocks, erroneously printed in our issue of December 17, *should have been* 85·5 *thousand tons.*

Chemical Industries' Good National Savings Record

BRITAIN'S industrial savings groups, with their membership of nearly three million people, account for two-thirds of all the money invested through group saving and contribute nearly £1 million a week to National Savings. For industry as a whole the average figure per head for employees saving through groups in the larger concerns is 6s. 6d. a week. Those in the chemical industries save 7s. 7d. Latest available figures of saving for three months in chemical firms employing more than 500 show that group members in these industries have saved a total of £241,389, and nearly 49,000 people are saving through 116 groups.

Though these high saving figures show that the chemical industries are playing an important part in the industrial savings campaign, there is thought to be still room for improvement. This can be brought about by higher membership of existing groups, or by providing savings facilities in firms where none at present exist. The methods of group saving in industry are varied and flexible, contributions either being collected in cash or, by agreement, deducted from pay.

The direct transfer method, by which savings are voluntarily deducted from pay and then transferred into the employee's savings bank account, is becoming increasingly popular in the bigger chemical concerns, while in a number of smaller firms savings stamps are sold. Savings are stimulated in many industrial areas by keen contests between different firms.

NATURAL RUBBER PROSPECT

More Scope in U.S. Markets ?

BETTER prospects for British natural rubber may derive from two decisions of which news is given this week. The Rubber Development Board has given some details of Malayan rubber producers' new decision to provide £8 million for research and development in the interests of the natural product. Supporting that plan, the Malayan producers are to give effect to a programme to improve the standing of Malayan rubber in the U.S.A.

It is intended that producers and rubber manufacturers shall work together to this end, without seeking either to raise prices of the natural material or to campaign against the qualities of the synthetic counterparts, which now monopolise a very large proportion of the American market.

The other good augury for British rubber, which is the British Commonwealth's largest single source of dollar trade, is the more liberal attitude shown in the recommendations on the control and use of synthetic rubbers which the President submitted to the U.S. Congress on Monday. Although Mr. Truman confirms the conventional American view that synthetic rubber capacity must be maintained, for strategic reasons, at a level adequate to supply the needs of any emergency, he forsees that consumption might safely be reduced to 200,000 tons annually, but not below 25 per cent of the total use of natural and synthetic rubbers.

In a separate report, the assistant to the President, Mr. John R. Steelman, has urged that American security would not be served by impoverishing the countries supplying natural rubber.

DOLLAR INVESTMENTS

Silicones and Refractory Industries

THE Dow Corning Company, Midland, U.S.A., is to invest $21,350 to assist the establishment in France of an industry to manufacture silicone insulating products. The French firm concerned is the Société Industrielle des Silicones, a branch of the Manufacture des Glaces et Produits Chimiques de Saint-Gobain, and the investment comprises a payment in cash, delivery of raw materials and their transport cost (in dollars).

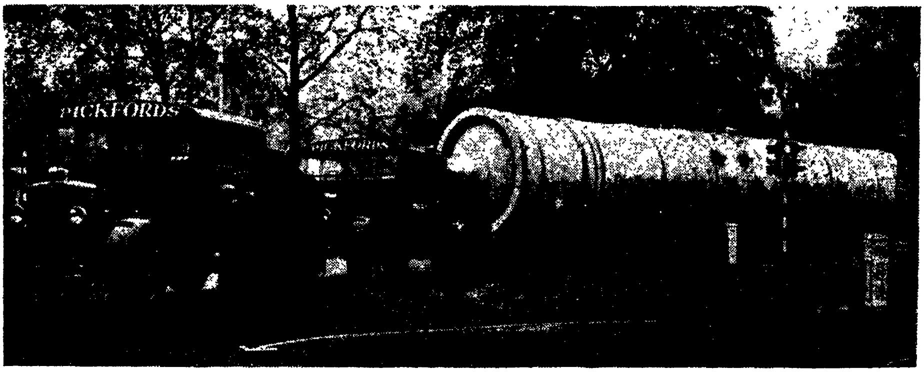
It is thought that production will start within a year and monthly output should be 1.5 to 3 tons. This will replace the purchase of silicone materials from the U.S.A., worth $35,000-$50,000 a year.

The French market is likely to absorb yearly a quantity equivalent to a value of $100,000-$250,000, allowing a surplus for export to other European countries.

$40,000 for French Refractories

The ECA has announced in Paris that the Corhart Refractory Company in Louisville (Kentucky) has invested $40,000 in the works of the Compagnie Française Electro-Réfractaire. This sum will be used for the construction of a new electric oven designed for the production of melted and moulded refractories which enjoy a steadily increasing demand from glass manufacturers in France and other countries.

The French company has had for several months more orders than it could readily supply, largely from glass manufacturers in France, Belgium, Great Britain and other European countries. France needs an increasing quantity of refractories for the projected modernisation of her glass industry.



Moving to Scotland one of the vast distillation columns required for the Shell Company's plant at Stanlow recently presented unconventional traffic problems

STATE CHEMICALS

Hints Renewed in Election Manifesto

SUGGESTIONS that a Labour Government, if returned to power at the forthcoming General Election, may take the decision as a mandate to bring sections of chemical industry under State control are contained in the manifesto which the Labour Party issued on Wednesday. According to this, "Let Us Win Through Together," chemical industry would be carefully examined by a reinstated Labour Government and "any appropriate sections" might be placed under public ownership, if that were necessary to assure national interests.

The earlier Labour Party policy statement for popular consumption, "Labour Believes in Britain," sought to represent some chemical industries as monopolistic concerns, referring more particularly to Imperial Chemical Industries, Ltd.

The latest statement largely confirms the earlier policy, indicating that it is intended to nationalise these further industries:—

Beet sugar manufacture and sugar refining; the cement industry; all suitable minerals; food-producing land not fully used; water supply; the wholesale distribution of meat; all cold storage plant.

New Detergent

IN Lensex 390, the latest addition to the range of detergents marketed by Shell Chemicals, Ltd., the petroleum industry has, it is stated, been enabled to provide for launderers and textile manufacturers a cleanser which will deal successfully with what is known as white work.

Shell Chemicals claim that this product, by comparison with its predecessors of the Teepol type, has better detergent properties, greater lathering power, better wetting and lime-soap dispersing qualities.

Such has been the interest shown in petroleum-based detergents by launderers and textile manufacturers that the Shell Company found it had become necessary to set up its Textile Service Laboratory in Bradford, to deal with the cleansing problems of those industries.

New grades have also been added to the Shell range of Apiezon oils, greases and waxes for high vacuum work. The C grade of oil is intended for use in condensation pumps where the lowest pressures are required; its vapour pressure at room temperature after evolution of dissolved air is 10^{-8} mm. mercury.

NORWEGIAN WHALE OIL

Britain's £4 m. Purchase

MUCH of this season's Norwegian whale oil production has been sold in advance, writes the newspaper *Tönsberg Blad,* quoted by the bulletin of the Royal Norwegian Information Service, London. Britain is the largest foreign buyer and has bought 50,000 tons at £80 a ton—£4 million altogether. Another 10,000 tons have been sold to Western Germany, which is also buying 7000 tons of processed whale fat from Norway.

The Norwegian Government is stipulating that 42,000 tons of whale oil should be reserved for the home market at a price below the current market price. The total production of whale oil by Norwegian expeditions this season is expected to be at least 160,000 tons. It is presumed that 100,000 tons of this will be available for processing into fat in Norwegian factories. Such oil realised £100 per ton outside Norway last year.

During the first 11 days of the Antarctic whaling season which began in December, the 10 Norwegian expeditions produced 101,660 barrels of whale oil, roughly the same as in the same period last year.

December Steel Output

BRITAIN'S production of steel ingots and castings in December was at an annual rate of 15,153,000 tons, compared with 14,678,000 tons in the corresponding month of last year, and 16,358,000 tons in November. This was the highest rate of production ever achieved in the month of December.

Pig iron output was at an annual rate of 9,659,000 tons compared with 9,150,000 tons in December, 1948, and 9,745,000 tons in November.

With an aggregate steel production for the whole of 1949 of 15,552,000 tons, the industry exceeded the upper limit of the Government target set at 15,250,000 tons.

U.K. Trade in December

EXPORTS from the United Kingdom in December were (provisionally) £153.8 million, bringing the provisional total for 1949 to £1784.6 million or 13 per cent more than the 1948 total.

The final quarter of 1949 was marked by a considerable increase in exports, the total of £470.2 million exceeding by £10.3 million the figures for the first three months of the year.

Imports in December were provisionally estimated at £195.4 million.

Drugs and Fine Chemicals in 1949

Stages in the Development of Cortisone

By G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

AS the last decade entered its final years it seemed impossible that the tempo of discovery and development of biochemicals and some related substances could fail to slacken. The pace for some 10 years had been phenomenal and seemed incapable of being maintained. Apparently it could, because virtually every year has revealed the culmination of at least one development of great significance.

Such results have been the reward of an immense body of research sustained by those, relatively few, qualified to contribute in the very complex phase in which such studies have now entered.

Seldom aware of more than the results and the amelioration of the human lot which they bring about, the layman may be excused for commonly seeing all this as no more than the rabbit from the conjuror's hat, whose failure to materialise would have been more arresting than its actual appearance.

The scientist seeks further for the roots of both problem and solution; he seeks for relationships with contemporary progress in other fields; he speculates upon the repercussions of the new findings in other, and often diverse, problems. But as scientists, we all fall short of perfection and are not true followers of the faith.

After Ehrlich

The reviewer seeks refuge in the thought—first Ehrlich, then the deluge! And an appropriate thought at the end of a half-century. Salvarsan, then the sulphonamides; penicillin and the antibiotics; then folic acid and, with the aid of newly developed chromatographic procedures, vitamin B_{12}; the vasoconstrictors, the antihistaminics. Admittedly, the antispasmodics and analgesics seem to derive from some lineage other than old father Ehrlich; but, doubtless, some diligent searcher in the field could find that, at some point or another, directly or indirectly, Ehrlich had made his intellectual contribution to this comparatively narrow and specialist field. And now cortisone and the hope and expectation that some of the painful ills that flesh—and especially aged flesh—is heir to will fall away at its magic touch.

Cortisone has its own long family tree: but, arbitrarily, it is permissible to start with consideration of the work of Hench and his associates, who have devoted their professional lives to the study of rheumatism and rheumatoid arthritis. These conditions, while only too well known by their effects, are so diffuse as to make classification difficult and impede study.

Against Rheumatism

A number of attempts at classification have been made from time to time. One classification has been proposed by the British Medical Association (*Brit. Med. J.*, 1933, 1033); another by the Ministry of Health (*Reports on Public Health*, No. 23, 1924); and yet another in 1934 by the International League against rheumatism. These and others reflect both the widespread interest in the subject and its difficulties. The following clinical classification is derived from one proposed by the Royal College of Physicians in 1936:—

1. Acute rheumatism (rheumatic fever) and sub-acute rheumatism.
2. Non-articular rheumatism (fibrositis, myalgic, lumbago, sciatica, etc., possibly neuritis).
3. Gout—acute and chronic.
4. Chronic arthritis. The rheumatoid type mainly affects women and especially at the beginning and the end of the child-bearing period. Inflammatory in nature it may be of unknown origin. Alternatively the origin may be known to be gonorrhœic, dysenteric, metabolic, etc.
5. Osteoarthritis. Mainly affects men and the larger weight-bearing joints. The general health may be unaffected. May be of unknown ætiology. Or may be senile or due to known shocks or central nervous disease.

This classification seems wide enough, yet some 10-15 per cent of known cases cannot be fitted into it.

That rheumatic diseases have now for some years been tackled on an international scale, is not surprising, in the light of the estimate that nearly 17 per cent of the industrial invalidism in England and Wales has been due to rheumatic disorders. They are thought to be responsible for an estimated loss of 3 million working weeks each year at an estimated cost to industry of £2 million. In the

U.S.A., 6 per cent of the population of 127 millions were considered to have suffered from rheumatism in 1936 (*The Med. Press*, 1949, *222* (17), 391). The magnitude of the problem is immense.

Hench and his colleagues at the Mayo Clinic have latterly been impressed particularly by the reversal of the progress of rheumatoid arthritis by such conditions as pregnancy; the systemic shocks of starvation or of surgical operation; or by jaundice. In these instances the disease seemed to undergo some inexplicable remission.

Causation of Rheumatism

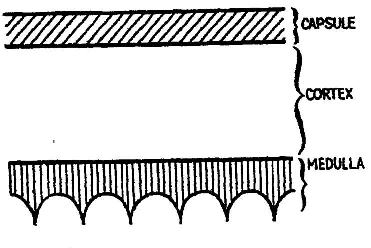
In association with Kendall (Division of Biochemistry, Mayo Foundation), the widely-held microbic theory of the causation of rheumatism was completely abandoned.

This led to the postulation of the existence of an "antirheumatic factor, x" which, potentially, was capable of reversing the progress of the disease. On the evidence which gradually became available it seemed that in every case of remission the common factor was that the suprarenal gland was stimulated.

In mammals there are two suprarenal glands which, in most species, are situated one each on the upper part of each kidney. The position among all mammals is not invariably in juxtaposition with the kidneys; for this reason it is preferred that they be referred to as the adrenal glands. Atrophy of the adrenal glands, or their surgical removal (adrenal-ectomy), leads to the death of the animal.

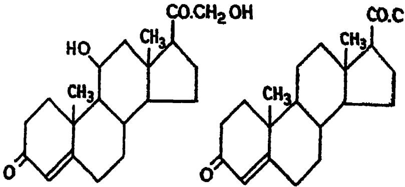
The commonest form of disease of these glands is Addison's Disease in which the salt metabolism of the body gets out of control resulting in an excessive secretion of sodium chloride in the urine and a corresponding reduction in sodium chloride content of the blood, often accompanied by pigmentation of the skin.

The adrenal gland consists of three principal parts and at least two of them secrete a battery of hormones:—



The active hormone of the medulla is adrenaline (epinephrine; alpha-(3: 4-dihydroxyphenyl) - beta--methylaminoethanol) a sympathomimetic amine, the action of which on the cardiovascular system was first demonstrated in 1895 and its structure elucidated by a number of workers over the period 1897 to 1904. It was synthesised independently by Stolz and Dakin in 1904 and 1905, respectively.

The adrenal cortex has been found to secrete several physiologically active steroids, one of the more active of which is corticosterone which closely resembles structurally the female sex hormone, progesterone, which is secreted by the corpus luteum.



CORTICOSTERONE

PROGESTERONE

Evidence seems to be accumulating that the functions of the hormones of the adrenal cortex and the functions of the hormones of the sexual apparatus are closely connected phyisiologically and biochemically.

Extracts of the suprarenal gland have been available to medicine since 1927 for the treatment of such conditions as Addison's Disease. One method of preparation of a suitable extract has been described by Cartland and Kuizenga (*J. Biol. Chem.*, 1936, *116*, 57).

The Adrenal Cortex

As a result of his studies of the adrenal cortex, Kendall has recovered some 20 distinct substances from it. Some of these were devoid of apparent physiological effect; but he was able to divide the active constituents into three categories:—

Group 1.—Regulating the body's salt supply.

Group 2.—Consisting of sex hormones.

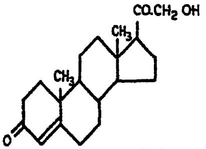
Group 3.—Containing two structurally similar steroids described originally as Compound E and Compound F.

In 1934, Kendall isolated a crystalline substance, essential to the life of the animal, from the cortex (*Proc. Mayo Clinic*, 1934, *9*, 245). A number of other workers — Reichstein, Wintersteiner, Pfiffner, etc.—isolated various crystalline components before the end of 1936.

The principal active constituent of Group 1, above, was found to be desoxycorticosterone, a powerful regulator of salt metabolism, upon which the constituents of Group 3 had practically no effect.

As in the case of œstradiol (a reduction product of œstrone), desoxycorticosterone was synthesised (by Steiger and Reichstein; *Helv. Chim. Acta,* 1937, *20,* 1164) before it was isolated from its endocrine source (by Reichstein and Euw; *Helv. Chim. Acta,* 1938, *21,* 1197).

Desoxycorticosterone in the form of its acetate (21-acetoxy-Δ^4-pregnone-3 : 20-dione) found official recognition in the British Pharmacopœia in 1948.



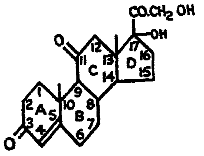
DESOXYCORTICOSTERONE

Its chief use is in the treatment of Addison's Disease.

It is in the physiologically active Group 3, however, that present interest mainly lies. This group has been found to have little effect upon the body's salt metabolism, but a very considerable effect on its carbohydrate metabolism, as well as on muscular activity and its ability to resist stresses, cold and toxic substances.

Kendall is reported to have suggested to Hench that compounds E and F be tested in the treatment of rheumatoid arthritis in accordance with the thought that the systemic shocks which produced remission of the arthritic condition were possibly associated with the stimulation of the adrenal gland.

Trials of Compound E, now named cortisone, and identified as 17-hydroxy-11-dehydrocorticosterone, were commenced at the Mayo Clinic some 15 months ago (Hench, Kendall *et al.; Proc. Mayo Clin.,* 1949, *24,* 181) and were attended by the spectacular successes which have been so widely reported.



CORTISONE; or, Kendall's Compound E; or, Reichstein's Substance F; or, 17-hydroxy-11-dehydrocorticosterone

The clinical and biochemical features of rheumatoid arthritis were found to be dramatically improved by daily intramuscular injection of cortisone crystals reduced 5 to 10µ in size and suspended in saline. (Subsequently, cortisone acetate was used.) In a matter of hours patients lost their tenderness, pain and stiffness and developed a pronounced feeling of well-being. Daily administration of 100 mg. cortisone has been found necessary.

The injections must be repeated each day as withdrawal causes the patient to revert to his arthritic condition. This need for continuous administration of the drug is paralleled in the case of another hormone, insulin. Side reactions have to be very carefully watched and there is a liability for the development of obesity, hirsuteness, amenorrhœa in women, depression, etc.

So far only minute quantities of the drug have become available and only a handful of patients have been treated. Kendall, *et al.* showed Compound E to have the above structure in 1938 (*J. Biol. Chem.,* 1938, *124,* 459). The carbonyl group in C-11 is very characteristic. It was found not to show the usual keto reactions or to add methyl magnesium iodide. The compound was reported to behave like a hindered ketone which enolised with the liberation of methane.

The synthesis of cortisone has been found extremely difficult, time-consuming and costly. Synthesis was first achieved by Dr. L. H. Sarrett, of the Merck Laboratories in 1946; but it took until 1948 to accumulate sufficient material for clinical trials. There are reported to be some 30-odd stages in the synthesis, which requires many months for completion.

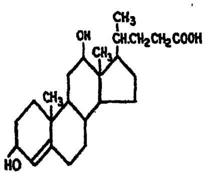
Compound E

As soon as the activity of Compound E was established and its structure worked out the search for a suitable raw material commenced. Since cortisone, in common with the sex hormones, the plant glycosides, and the sterols, is a *cyclo*pentenophenanthrene derivative, the naturally occurring steroids were clearly indicated as possibilities. The bile acids seemed to be the most readily available source and it is reported that, at present, the bile from every animal slaughtered in the Chicago stockyards is set aside for the synthesis.

But the product from 40 head of cattle is required to produce sufficient cortisone for a single daily dose for one patient, and there are 6 million arthritics in the U.S.A. alone. There would not be enough ox-bile in the world to treat all sufferers. It is estimated that the material currently costs about £250 per gram and that 200 grams is about the present peak production in the U.S.A.

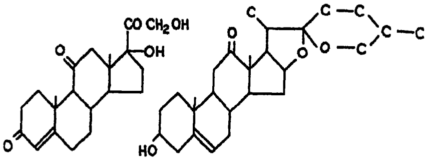
The principles involved in the manufacture of adrenal cortical hormones have been described by Kendall *et al.* (*J. Biol.*

Chem., 1946, *182*). The particular bile acid used is desoxycholic acid which, like all the bile acids, is a derivative of cholanic acid and which is specifically 3 : 12-dioxycholanic acid.



As will be seen later, the particular interest in desoxycholic acid is the hydroxyl in the C-12 position. Sarrett's important contribution was the devising of the step which enabled the necessary hydroxy group to be introduced at the C-17 position.

Alternatives to the use of ox-bile are now being intensively sought, especially in the plant world. A preliminary source is the steroidal sapogenin, botogenin, which occurs in the yam, *Dioscorea mexicana*. Botogenin has been studied by Marker and Lopez (*J. Amer. Chem. Soc.*, 1947, *69* (2), 2397) who produced it by alcoholic extraction of the plant, followed by acid hydrolysis and subsequent solvent extraction and crystallisation. Its structural relationship with cortisone is shown below :—



CORTISONE BOTOGENIN

Another source of raw material is the seeds of the tropical vine, *Strophanthus sarmentosus*, a plant which requires five years to mature before seed is borne. One ton of this seed would be required to yield enough cortisone for one patient for one year. In this case the active constituent in the plant is the crystalline aglycone, sarmentogenin, a trihydroxy-$\alpha\beta\gamma$-lactone with 23 carbon atoms and four saturated rings.

It is claimed that the steps in the synthesis of cortisone can be halved in number, were sarmentogenin available, to dispense with the number of steps in the synthesis starting from desoxycholic acid.

(*To be continued*)

Chlorine Content of Aluminium Paper Laminates

WHEN using aluminium foil as a functional—as distinct from a purely decorative—material, it was usually necessary to add either a coating or some other material, such as paper or transparent film, before the foil could carry out its job, which was mainly that of a moisture vapour barrier, said Mr. W. A. Harrington (Venesta, Ltd.), in his paper on " Aluminium Foil as a Packaging Material." This was read at a recent meeting in Manchester of the Northern Branch of the Institute of Packaging.

Experiments were being made in this country, said Mr. Harrington, and in Scandinavia with a heavier gauge coated foil which would do the job formerly accomplished by the traditional butter wrapper consisting of thin foil laminated to parchment in which the duty of the foil was the exclusion of light, protection against pick-up of extraneous odours, and enhancement of appearance of the pack.

The addition of paper to the aluminium foil created certain chemical problems which had to be solved, to prevent damage to the container and, in some cases, its contents. For foil and paper laminates, it was necessary to check the chloride and sulphate content and also watch for free acidity in the paper.

Equilibrium moisture content in this country was in the region of 7 per cent, and unless the chloride figure (expressed as chlorine) was less than .07 per cent, corrosion of the foil would almost certainly take place, showing as unsightly white worms or blotches.

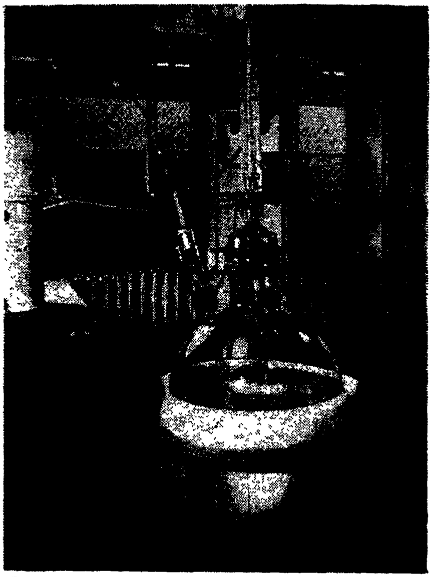
Large numbers of wads for jar lids, etc., disfigured by white stain resulted from using backing material of high chlorine content. In one instance, a foil and paper laminate held in this country for some time before being shipped to Colombo was dispatched in good condition, but after picking up additional moisture in that more humid climate, raising its content to about 9 per cent, the chlorine in the paper found sufficient moisture to corrode the surface of the foil.

Work was now proceeding on an investigation into the use of inhibitors with adhesives.

PLANT HEATING DEVELOPMENTS

Enlarging the Scope of Electric Surface Appliances

by H. REIK, M.Sc., A.M.I.E.E., A.M.I.Mech.E.*



[Courtesy, Therapeutic Products, Ltd.

An advanced form of electrically heated glass processing equipment, employing a mechanical stirrer and refluxing appliances and a 100-litre Isomantle with an adjustable stand

SHORTLY after the war, electric heating mantles for laboratory glass ware were introduced. In the form of Isomantles, these consist basically of heating wires interwoven with glass yarn to form a pliable heating mat of the required wattage, shaped to surround a particular vessel or column. The whole is lagged with glass wool (bat mats) and fitted with an outer layer of glass cloth.

The advantages of uniform heat distribution—safety, inertness to chemicals and the fact that liquids with distillation temperatures of up to 360° C. can safely be handled—have commended this method, particularly for laboratory use.

It is rather surprising that surface heating has so seldom been applied to metal plant. Isomantles for glass flasks of 50 to 100-litre capacity have been in use for some time. They have a loading of 3000 and 4000 watts respectively, providing 5000 and 6500 CHUs in the liquid itself. Even larger units are being designed in co-operation with the glass plant manufacturers.

These plant mantles have several circuits so that the upper levels can be switched off or moderated as the level of the liquid drops during batch distillation. A typical control unit, contains four separate energy regulators, each controlling one circuit. The flexibility of this method is evidenced by the variation provided where top condensation is to be avoided. For this, Isotopmantles are made to supply slightly more heat than needed for keeping the top half of the flask at distillation temperature. Their rating is usually one-third to one-quarter that of the bottom mantle.

Isojackets, the column and pipe heaters of cylindrical shape, are designed to overcompensate amply for heat losses in the pipe lines or columns to which they are applied. They can be slid onto existing assemblies, as they open axially.

The construction of Isomantles allows for flexibility in design and standard units are made with holes in the bottom to allow for drain-off cocks or circulation processes, and equivalent provision can be made for side necks.

The CHUs provided by the Isomantle are limited by its surface; 6000 Watts (10,000 CHUs) for 100-litre Isomantle and Topmantle should not be exceeded. This limits the distillation rate and a successful solution has been found by introducing circulation heating and providing the additional heat needed with a high wattage Isojacket or double walled boiler heat exchanger.

High Wattage Isojacket

The latter type is the newest development. In a typical example a standard 6, 9 or 12 in. glass column has an inner column of 4, 6 or 9 in. bore, fitted so as to produce a double walled vessel with a passage of ½-1 in. between the inner wall of the outer column and the outer wall of the inner column.

A high wattage Isojacket is then applied to the outer column, while a similar jacket, having its element fitted to its circumference, is inserted into the inner column. This allows for the application of increased wattages (up to 13½ kW per assembly of Isomantle and boiler heat exchanger).

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* Consultant to Isopad, Ltd.

Full wattages can be used up to 200° C., but it is advisable slightly to reduce the power applied (if automatic temperature control is not employed) when running at higher temperatures; a minimum heat gradient, determined by the thickness of the glass and the nature of the fluid is necessary for heat transfer.

Heat Distribution

The following table gives the sort of wattage ratings for various sizes of high wattage jackets and boiler heat exchangers and CHUs available in the liquid at various temperatures. The figures are approximate.

The first figure of the type number denotes the length of the heating jacket in inches, the second figure denotes the diameter of the column wall to which the jacket is applied, in inches.

In the case of viscous fluids or where the heat exchangers are used at the bottom of stills to replace steam coil heat exchangers it is often advisable to reduce the above figures by 25 per cent. Large boiler heat exchangers running at 670 Watts/sq. ft. surface density should be used, either with thermocouple or thermostat type heat control set to a limited temperature of 400° C. or slightly less.

All units are designed to run at black heat if necessary. The wattage input is controlled by Simmerstat type energy regulators. These are time cycle controllers incorporating a switch giving a varying " on "-" off " cycle, which facilitates energy changes from 100 per cent to 10 per cent of total thermal capacity. Variac auto transformers can also be used, while transformers with tapping control are often applied for higher powers. These are particularly useful in the case of metal plant, where they also serve as step-down transformers, reducing the element to earth potential.

When higher powers, high temperatures and expensive assemblies are involved and the possibility of human error must be avoided it is advisable to use either automatic temperature control, probably in the form of a thermocouple and relay control set to any desired temperature.

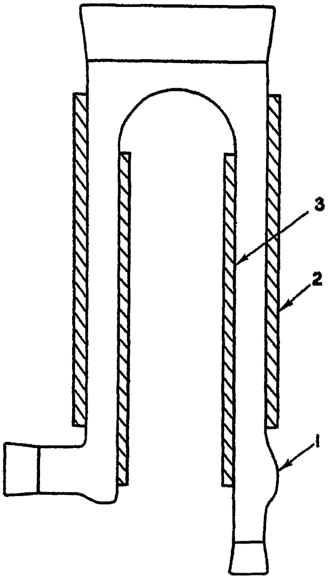
A simpler type of control uses a high temperature liquid which expands in a fine-bore pipe. The only disadvantage of this type is the length of stem needed, but it is suitable for the larger type units. It is good practice to use independent energy and temperature controls.

It is customary to employ for glass con-

(*continued at foot of next page*)

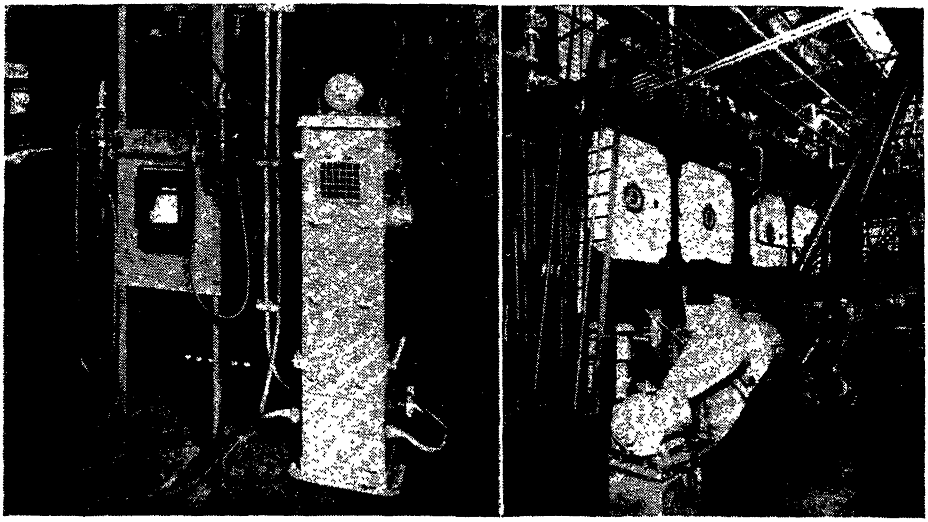
BOILER HEAT EXCHANGER RATINGS

Heater Type	Watts	C.H.U. available in liquid at				
		150° C.	200° C.	250° C.	300° C.	350° C.
18/4½ or 12/6½	1,000	1,600	1,600	1,450	1,300	1,100
18/6½	1,500	2,400	2,400	2,170	1,930	1,650
18/6½ and 18/4½	2,500	4,000	4,000	3,600	3,200	2,700
18/9½	2,400	3,850	3,850	3,500	3,150	2,600
18/9½ and 18/6½	3,700	5,000	5,000	4,500	4,000	3,400
24/9½	3,000	4,800	5,800	4,350	3,850	3,300
24/9½ and 24/6½	5,000	8,300	8,300	7,500	6,700	5,700
18/12½	3,000	4,800	4,800	4,350	3,850	3,300
18/12½ and 18/9½	5,000	8,300	8,300	7,500	6,700	5,700
24/12½	4,000	6,500	6,500	5,900	5,200	4,400
24/12½ and 24/9½	7,000	11,600	11,600	10,500	9,300	8,000
30/12½ and 30/9½	8,700	14,300	14,300	13,000	11,500	9,600



The principle now being employed to make possible greater use of electrical surface heating in a circulating system. The column (1), fitted with an Isojacket (2), sheathes an inner column, to which is applied another heating jacket (3)

IMPROVING THERMAL EFFICIENCY



The CO_2 recorder, which provides a reading ahead of the ID fans as a measure of combustion efficiency within the furnace. Right: The Babcock and Wilcox WT boilers at Laporte Chemicals, Ltd. Pulverised coal is fed from the pipes into troughs and sifted into the chain grate stokers to feed the furnace

THE desirability of saving fuel in the heavy industries, ensuring that all coal should be put to the best use, was emphasised by the Minister of Fuel and Power (Mr. Hugh Gaitskell) at a conference of the technical Press, held in Luton this month. An opportunity was also afforded by Laporte Chemicals, Ltd., to inspect the continuous process for the production of barium chemicals.

Although Laporte Chemicals is confident that its fuel efficiency is of a high standard, Mr. L. P. O'Brien, the company's chairman, has expressed the opinion that the Ministry's travelling team of fuel technologists might find a number of minor defects which could be remedied to constitute a worthwhile economy (THE CHEMICAL AGE, 62, 5).

The team is spending a month at Luton, studying fuel consumption at each phase of the production process, at the end of which its findings will be reported to the company and remedial suggestions made.

PLANT HEATING DEVELOPMENTS

(*continued from previous page*)

densers heat transfer figures of up to 50 CHU/sq. ft. 2° C. These figures cannot be used in conjunction with plant type Isoheaters as the glass plant concerned has a wall thickness which may be five times that of the coils used for condensers or steam-type heat exchangers. 5-10 CHU/sq. ft. 2° C. are good average figures. The upper limit can be exceeded in cases of liquids with favourable film coefficients.

Glass wool lagging is taken as having a thermal conductivity of 0.30 or less CHU/cu. ft. 2° C. per hour. As the average lagging thickness of plant type Isomantles is 2½-3 in. they will run at over 95 per cent. efficiency under favourable conditions. Boiler type heat exchangers have nearly 100 per cent efficiency for the inner jacket and about 93/95 per cent efficiency for the outer jacket, giving a combined efficiency of over 95 per cent.

Designers should assume 500 Watts per sq. ft. without circulation and up to 700 Watts per sq. ft. with circulation.

Isoheaters for metal plant up to 500 gal. capacity use glass lapped, braided and silicone dipped, heating elements as well as a special layer of glass cloth between the heating panel and the metal surface. This will give high insulation value but will not make the heater waterproof, so that spillage on to the elements has to be avoided. The metal parts should always be well earthed.

PRINTING INK TECHNOLOGY

Electronics as an Aid to Colour Measurement

As a result of the advances in printing ink technology, achieved during the past quarter of a century by a few laboratories in three or four different countries, a stage has been reached when it seemed that the tail was wagging the dog—the tail being the printing ink industry and the dog being the printing industry, said Dr. R. F. Bowles (B. Winstone & Sons, Ltd.). He was taking part in a survey of "The Relation of Paper and Ink in Printing," by representatives of the paper, printing and printing ink industries, at the meeting of the London section of the Oil and Colour Chemists' Association, on January 12.

Physical Characteristics

He felt sure that future developments also would be along those lines rather than on any more empirical ones which might be more applicable to other industries.

The problems of printing ink technology, said Dr. Bowles, were physical and, as usual, they had a chemical background. Certain physical properties of inks were essential, and over the last two or three decades the technologists had fairly successfully devised means of measuring them. The three types of physical properties it was most important to measure were colour, consistency and drying.

Colour was the most important physical attribute of a printing ink, and unfortunately it had been last to be scientifically developed so far as its measurement was concerned. Referring to the high degree of sensitivity of the human eye, and the comparative neglect of the development of physical instruments for measuring colour, Dr. Bowles said that colour matching was the point on which there had been most disagreement. The modern developments in electronics, however, had now given us the recording photometer, which was capable of giving a record of colour, irrespective of the human eye. That was the greatest single development in the colour measuring field during the last 20 years.

Unfortunately, the electronic instruments were still prohibitively costly, and in consequence were being introduced into the industry extremely slowly. As an example of the present tendency, however, Dr. Bowles quoted the new three-colour standards for printing inks, issued by the British Standards Institution, which gave a final reference to a special photometric standard. It could be expected that in another decade a photometric curve might well be an initial point of reference.

As to consistency, the various printing processes involved such varying requirements in ink that it had been necessary to explore the whole of the rheological field. For example, inks such as the photogravure ones were to all intents and purposes Newtonian fluids; for off-set and lithographic printing the inks required were thixotropic suspensions; and for copper-plate inks and steel engravings there were required dilution systems, which became thinner rather than thicker. Those different types of rheological behaviour could be differentiated by the empirical flow test, details of which had been published in the technical Press 18 months or two years ago.

Several methods of drying had been known for a very long time, and in the last 20 years sufficient work had been done to give a broad understanding of the subject. Oxidation drying was now quite well understood, which was due mainly to work done outside the printing ink or the paint industries. The oil and rubber people had studied it, and he recommended the reading of the excellent survey on the subject published in the quarterly review of the Chemical Society (first number of 1949).

Absorption and Evaporation

Absorption drying had lagged behind; probably it was thought necessary to understand oxidation drying first. Absorption drying was now being studied in a large number of laboratories, and certain information was already available which enabled it to be applied. The reflectance technique, whereby the difference in reflection with time from the surface of an ink immediately after printing was recorded. enabled one to study how the ink medium filtered into the paper and left a matrix of oil and pigment on the surface, which eventually dried to give the final film.

Evaporation, which appeared to be the simplest mechanism of drying, had received comparatively little attention, perhaps because it appeared to be so simple. Very little absolute information was available, for the subject had not been studied sufficiently fundamentally. There was no fundamental information available in the literature at all on the evaporation of any pure liquid. It was the least understood section of the problem of drying, but efforts were being made to study and understand it scientifically.

Developments to which Dr. Bowles drew attention were the heat-set inks, in which the drying was accelerated from the normal seven or eight hours to a split second; drying of inks by precipitation; and the use of colloidal media for the production of quick-setting inks, which had enabled the setting time to be reduced from the normal half-hour or so—as it was some 20 years ago—down to two or three seconds. There had now been a compromise on a setting time of two or three minutes, the point being that the matter had been studied so that the setting time was definitely under control; the inks could be so arranged that they would set in two seconds, two minutes, half-an-hour, or whatever time was required. One was no longer at the mercy of the materials one had to use.

There was still a great necessity, Dr. Bowles concluded, for more co-operation between the paper maker and ink maker; the more advanced one became in study, the more necessary was co-operation.

A Filtration Process

In the course of the discussion which followed the reading of the several papers, Dr. Julius Grant (Thos. Owen & Sons, Ltd., paper makers), replying to a question concerning the fundamental process of absorption drying, said that mainly—and certainly in the case of water—it took place by the entry of the liquid between the fibres of the paper. There was no evidence that there was any great degree of absorption by the fibres themselves in normal circumstances.

Dr. Bowles agreed and, as a corollary, he said he had found, as the result of his studies of the residual film on the paper, that there was a simple filtration and a penetration of the medium into the absorbent paper, leaving a concentrated suspension of the pigment in a portion of the medium on the surface of the paper. Curiously enough, that occurred to only a limited extent, limited presumably by surface tension forces, and the film which eventually remained consisted of an approximately cubic packing of particles in the residual medium on the surface of the paper. Normally there was just sufficient medium there to hold the particles in that cubic packing, and apparently nothing could remove that amount of medium from the film.

Mr. S. Beard said there were mainly two sorts of properties on which the absorption seemed to depend. First, when an ink was applied to paper, the diluent, whether volatile or non-volatile, must be free to penetrate the paper, leaving on the surface a concentrate which bound the pigment to the paper. If the whole ink were too stable, then, although it was composed of ingredients which would dry rapidly on the paper, no appreciable drying would take place. Secondly, one paper apparently, under oil absorption test, would have drying properties equal to those of another, but for some reason a known ink would flake to a certain extent on one and not on the other.

Persistent Films

Dr. Bowles said the point was a fairly general one. Using a non-drying ink—one which did not dry by oxidation or by any chemical process—if one deposited a film on the surface of the paper and took precautions so that the filtration did not occur, obviously the film would remain as a liquid on a semi-solid. At the other extreme, the film was deposited from an ink containing either a volatile solvent which would evaporate and leave sufficient pigment to bind into the surface, or where the interfacial forces between the ink medium and the paper were so small that more of the medium would penetrate into the paper than was necessary to hold the pigment to the surface.

It was just possible, said Dr. Bowles, to do that under exceptional circumstances; and in both those hypothetical cases there would be a condition of powdering in which the dry pigment could be rubbed from the surface. That condition, however, was the exception rather than the rule, and usually the ink maker arranged his pigment and vehicle so that the film remained on the surface; in some cases it would remain in an unoxidised semi-liquid state, and in others it would eventually oxidise and dry to a hard rub-proof film.

Packaging

INITIAL response to the suggestion to hold in London a second National Packaging Exhibition has resulted in the securing of the National Hall, Olympia, for the period January 30-February 9, 1951. The Institute of Packaging, which announces that plans will be available within a month, is again to collaborate with Provincial Exhibitions, Ltd., in sponsoring the exhibition. The British packaging team, which, under arrangements of the Anglo-American Council on Productivity, has been in the U.S.A., is due to arrive in England on February 2.

Chemistry Education in Spain

Advanced Standards in Science and Engineering

THE claim that chemistry instruction in all its forms has now attained a high level of efficiency and comprehensiveness in Spain was made in a paper by Dr. S. Medina-Castellanos, which was read at the 22nd Industrial Chemistry Congress, held recently in Barcelona. A special issue of *Chimie et Industrie,* and the November issue of *ION,* containing abstracts of this and other papers, included illustrations of university chemical departments in Madrid, the laboratory of the School of Industrial Engineers in Barcelona, and that of the School of Industrial Chemical Experts in Tarrassa.

Fields of Study

The author recalled that there are now chemical departments in a dozen Spanish universities: Madrid, Barcelona, Granada, Murcia, Oviedo, Santiago, Salamanca, La Laguna, Sevilla, Valencia, Valladolid, and Zaragoza. The fields of chemical study in these establishments extend to the most advanced theory and practice with a good groundwork of mathematics and physics. Generally the curricula were similar to those taken in English universities, extending for five years or more, and including a doctorate thesis in or near the final term. A doctorate in industrial chemistry was an almost exclusive feature of Madrid University. At the other universities, the doctorate degree was more general and possibly also more theoretical.

Particular importance was attached to the profession of the industrial engineer, for which training there were three establishments: at Madrid, Barcelona and Bilbao. They were known as Escuelas de Ingenieros Industriales, and comprised three principal categories: mechanical, electrical, and chemical.

Throughout their training the engineering students were in close touch with actual factory conditions and problems. They were selected by an entrance examination, and during the first three years their studies were general engineering common to all the above categories; but for the last year or two they specialised in one only of these three divisions. For the chemical engineer a wide knowledge of metallurgy in most of its branches is deemed essential.

Closely related to the industrial engineers were the chemical industrial experts, of which there were four main divisions: mechanical, electrical, textile, and chemical. Of the twenty schools provided for their training, about twelve had courses for the chemical expert, extending for four years. At the Barcelona, Bejar and Tarrasa schools there were specialised courses for the textile chemist.

Attention was drawn in particular to the very individual Instituto Quimico de Sarria, near Barcelona, established in 1905 by a Catholic religious body, and providing, in addition to a thorough training in chemical science and practice, a rigorous moral or religious discipline. A rather strict entrance examination is imposed here. Successful students gain the diploma of IQS.

Other chemical training centres include those for directors of chemical industry, the pharmacy and speciality faculties at the universities, and schools for agricultural, mining, and other specialised chemists. The main centre for the first is the Instituto de Quimica Applicata at Barcelona, established in 1915, where, it is claimed, new pedagogic methods originated for instruction in chemistry. It possesses extensive laboratories, industrial plant, libraries, and information bureaux, and many of its former students are among the leading chemical industrialists in Spain.

Post-Graduate Help

There are also many post-university and specialised centres for most branches of scientific study, including chemistry, mostly under the supervision of the Consejo Superior de Invectigaciones Cientificas. For pure (theoretical) chemistry there is the Patronato Alfonso el Sabio with the Instituto Alonso Barba (Chemistry) and the Instituto de Santa Cruz (Physics). For applied chemistry there is the Patronato Juan de la Ciervas, and several institutes for the different branches of chemical industry: iron, cement, oils and fats, welding, paints and varnishes, etc.

Belgian Pyrethrum

Greater competition with Indonesia from the Belgian Congo is indicated by the selection of Goma, province of Kivu, as the centre for processing the pyrethrum blossoms. The removal from the present site at Costermansstad is to form a better link between the respective planters of Northern Kivu and Ruanda.

IMPROVED CONTAINER DESIGN

Safer Conveyance of Solids and Liquids

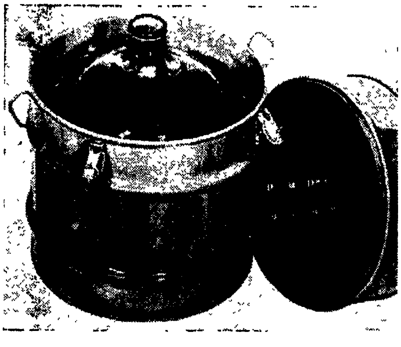
THE problem of devising a satisfactory corrosion-resistant lining for metal packages has been a subject of experiment for many years. Rubber, enamel, lacquers and other coatings have been tried with varying degrees of success. In many cases the application of a coating has necessitated the fabrication of drums from thick sheet, since damage to the drum frequently causes the coating to crack and expose the steel. Other coatings involved complex and costly methods of manufacture.

It is hoped to produce soon a polythene lined drum, which may be the solution of some manufacturers' difficulties. The advantages of polythene are that it has flexibility, plasticity and at the same time is resistant to tearing and scratching, it weathers well, is tasteless, colourless and non-toxic. It is chemically inert to a very wide range of substances, including most acids at normal filling, storage and transport temperatures.

The drums will be in production during 1950.

The superior protective properties of aluminium as compared with steel recommend its use for packaging a large number of products. From the technical point of view, however, its lightness and the considerable difficulties involved in satisfactorily welding aluminium by mass production methods have delayed its employment on a very large scale.

To solve these two main problems an aluminium drum within a steel drum has been devised. The aluminium-lined drum consists of a strong steel outer covering with an inner wall of electrically-welded aluminium sheet.



A carboy cushioned on sponge-rubber buffers within the hamper

The alternative method of adding strength to aluminium came with the introduction of aluminium alloys, which, with high speed electric welding of side seams, has led to the development of almost as wide a range of aluminium-alloy packages as of steel.

The heavy-gauge plastic liner, with welded tube passing through the drum neck to ensure the contents have no contact with metal

The principle of an inert plastic lining is employed in a patent product of Reads, Ltd., the container makers, of Liverpool, in association with Tanks & Linings, Ltd., Droitwich. This, Nutrapac, is a combination of a full-aperture steel drum and an inner collapsible bag or liner manufactured from heavy-gauge polyvinyl-chloride or other inert material. The liner is so constructed that when full it conforms exactly to the internal dimensions of the drum. Seams of the liner are electrically heat sealed to prevent leakage.

Contents can be poured out, drawn out through a tap or blown out by compressed air injected between the drum and the liner. The plastic liner can then be completely removed for cleaning and replaced.

The carboy hamper consists of a reinforced drum with a, deep, detachable lid which is secured to the body by steel clips. The carboy is simply and firmly fixed in the hamper where it is cushioned on sponge-rubber buffers. The main object of this container is to protect the neck of

(continued overleaf)

NEW BOARD OF TRADE DEPARTMENTS

Better Integration of Responsibilities

THE home side of the Board of Trade has been re-organised as from January 16. The object has been to reduce the number of divisions in the board with which a single industry or firm has to deal. The work on each raw material has now been put as far as possible in the division concerned with industries which consume that raw material.

This means that the Raw Materials Department and Priorities Division will disappear as separate entities and their functions will be merged in the industrial work of the Industries and Manufactures Divisions. The four divisions concerned with particular industries include:—

Division IM2A: Cotton, wool, rayon, nylon and silk (the raw materials and all manufacturing processes); flax (spinning and all subsequent processes); other textiles and garments.

Division IM2B: Organic and inorganic chemicals; fertilisers; rubber and tyres; pottery; miscellaneous commodities (including china clay); consumer goods industries (including bedding and laundries).

Division IM2C: Timber, furniture and timber-using industries; pulp, esparto, paper, paper products and printing; hides and leather; footwear, gloves and leather goods; jute, sisal, manila, hemp and supply of flax.

Division IM2D is concerned with tourist industry; tobacco and trades with a predominant entrepot interest. The Films Branch will continue as before but will have in addition responsibility for film base and for sensitised photographic materials.

At the same time the general work of the home departments of the Board of Trade not related to particular industries, has been concentrated in three divisions to be known collectively as Industries and Manufactures I as follows.—

Division IM1A: All price control; restrictive practices; retail trade dstributions; consumer needs.

Division IM1B: Import policy and import licensing (with Import Licensing Branch); United Kingdom tariffs and key industry duties.

Division IM1C: Investment and general industrial policy; industrial buildings; weghts and measures (with Standards Branch).

This re-organisation will not affect the distribution of industry and Regional Division, the divisions dealing with insurance, companies and bankruptcy, the Patent Office, or the Administration of Enemy Property Department.

Lithopone Freed from Control

THE Board of Trade announces that from January 31 it will cease to control the allocation of lithopone manufactured in the United Kingdom. The distribution of imported lithopone is already free from control.

Home production is considered to be not yet sufficient to meet all orders received by the makers and for the present they will not be able to meet all demands in full, the Board of Trade anticipates.

IMPROVED CONTAINER DESIGN

(*continued from previous page*)

the carboy from breakage. There are two fall-down type riveted side-handles.

Carboys fitted in conventional type hampers are usually packed again into a wooden case, when the contents are for export. The carboy hamper greatly reduces labour and material costs.

The incorporation of pressed-out roller hoops in a drum body presents no technical difficulty with drums which have a welded side-seam, but in the case of tinplate drums with a locked side-seam, owing to the several folds of metal in the locked seam, the problem was an intricate one.

After considerable research a 5-gallon drum in light-gauge tinplate was developed. It can often be used on a returnable basis, owing to the extra strength given by roller hoops.

Drums having a ringseal neck, claimed to be proof against pilfering, have now been provided with a pourer spout fitting incorporated with the neck, the shape of which is said to give better flow-control with less spillage.

The ER interrupted chimb drum, designed to strengthen the top seam or chimb, and also simplifies stacking, and another recent innovation, the Flexspout closure, suitable for containing internally lacquered packages, have earlier been illustrated and described in some detail (THE CHEMICAL AGE, *61*, 522).

EXPANDING CAPACITY IN SOUTH AFRICA

Widening Fields of Chemical and Paint Production

From Our CAPE TOWN CORRESPONDENT

THE first experiment in South Africa to surface gravel roads with calcium chloride has been started about three miles from Bloemfontein by the Provincial Administration in co-operation with African Explosives and Chemical Industries, Ltd. Because of the shortage of calcium chloride, which is imported from Britain, the experiment is restricted to a limited distance. The hygroscopic effect of calcium chloride in gravel road surfaces is to prevent dust erosion, which causes potholes and corrugation. The road surface is reported to have taken on the appearance of a macadamised road.

* * *

Production of magnesium hydroxide has been started by the Vrany Chemical Corporation of S.A., Ltd., a company recently formed to extract salt and chemicals from sea water. Magnesium salts are first extracted, the residue is treated to extract common salt, after which the potassium and bromide salts are separated. A property containing a big limestone deposit for use in this operation has been acquired, and lime-burning kilns have been erected. Refined table and dairy salt, besides commercial salts, will be extracted early this year. The Vrany Salnova Works, Ltd., a second company of the same group (African & Overseas Enterprises, Ltd.), has acquired a dry lagoon at Port Elizabeth for development simultaneously with that at Saldanha Bay. The object there is to extract salt from the concentrated brine.

* * *

The South African Paint Manufacturers' Association and the Council of the Transvaal Chemical Manufacturers' Association is again pressing for Imperial pints and quarts to be the compulsory standard in the Union. There is at present nothing to prevent the use of the shorter American measures. American manufacturers of paint and chemicals have been able to sell in the Union " gallon " tins of products containing about four-fifths of similar " gallon " tins of Britain or South Africa. American manufacturers have enjoyed the advantage of apparently lower prices. South African manufacturers seek to enforce the compulsory adoption of regulations as stringent as those in the United States against " foreign " measures.

C. F. and H. Rolfe Bros. (Pty.), Ltd., Germiston, Transvaal, has added to its normal chrome products pure chrome oxide green and zinc chromates. They are being sold to manufacturers of roofing and other paints and to the rubber and plastics industries. The zinc chromate is manufactured to the highest oversea specifications. Current shortage of supplies of raw materials is causing concern to manufacturers in the paint and associated industries. Industrial Chemical Products (S.A.) (Pty.), Ltd., 139 London House, Loveday Street, Johannesburg, is making a new rubberised underbody coating, claiming that it prevents " drumming " and " tinniness " in sheet metal structures. The coating is applicable to motor vehicle bodies, metal sinks, steel furniture and lifts. The Netherlands African Paint Factory (Pty.), Ltd., Elsies River, near Cape Town, is to produce high-quality nitrocellulose alkydised motor vehicle body lacquers and synthetic enamels.

* * *

An application has been made by paper manufacturers for the rebate of import duties on sizes of all kinds used in the paper-making industry. Since 1925, resin in bulk for this purpose has enjoyed a rebate. In recent years, however, manufacturers have adopted the use of proprietary sizes which they find more satisfactory for certain types of paper. These sizes, however, are dutiable (10 per cent). The industry asks that this duty be rebated and the Board of Trade and Industries, noting the rapid growth of the paper industry, has recommended to the Government that the present rebate facilities on resins should be extended to all sizes.

* * *

The South African Council for Scientific and Industrial Research is investigating the industrial suitability of South African clays, which it is aiming to classify with their base exchange properties, binding powers, etc. So far this investigation has not been directed towards the assistance of any particular industry. With one exception, all clays used in South African foundries are imported, but the council states that a clay has been discovered locally which appeared to be a bentonite. The foundry industry is now being encouraged to put this and other clays to a series of practical tests.

The Chemist's Bookshelf

CANNING PRACTICE AND CONTROL. 3rd edition revised. Osman Jones, F.R.I.C. London, 1949. Chapman & Hall, Ltd. Pp. 322. 36s.

The diverse range of specialist subjects whose several contributions make possible the efficiency of the modern canning industry—metallurgy, chemistry, microbiology, etc.—is called to mind by this book. The vital importance of the chemist, "who must be a watch-dog while avoiding giving the impression that he is a policeman," is emphasised in a chapter devoted to the cannery laboratory and its work.

This is a revised 3rd edition, giving a fuller description of, among other matters, the manufacture of tinplate and the causes of corrosion and discoloration. The newer methods of analysis, including chemical and biological assays for vitamins are discussed. Methods of examining suspected matter in cases of food poisoning are also described and there is a chapter on the preparation and use of culture media.

The large selection of photographs of plant and equipment, and a number of photomicrographs of spoilage organisms form a valuable complement of the text. Tribute is paid by the author to Mr. T. W. Jones, who has been unable to participate in this edition and has resigned his former co-authorship.

MODERN PLASTICS. Harry Barron. London. 1949: Chapman & Hall, Ltd. Pp. 779. 50s.

This book is a revised and greatly enlarged second edition of a work published in 1945, dealing with the entire range of synthetic and semi-synthetic resins and with analytical aspects of these materials and physical testing methods. The work as a whole suffers from incomplete revision, *e.g.*, on page 9 it is stated that Germany ranks second in the production and consumption of plastics. This was undoubtedly true in 1948 but it certainly is not to-day. Britain is a close runner-up to the U.S.A., in the output of plastics. Figures for the annual production of certain structural and industrial materials in the U.S.A. are given for the years 1939 and 1944. The total for the latter year in plastics is 90 million lb. and aluminium 2179 million lb. (page 5). It is a pity that statistics over five years old should be quoted, as they lose their point. From the figures given it might be assumed that the output of plastics, taking the world viewpoint, lags far behind that of aluminium, whereas to-day, a tonnage of plastics equal to that of aluminium is being produced. In the chapter dealing with acrylics there is no mention of one of the more important applications of British acrylic sheet—as corrugated sheeting for roof lighting, which reaches a production exceeding 1000 tons a year and is by far the most important use found for acrylics. Surprisingly enough, generous mention is made of polyurethane, which is chiefly of academic interest, and no reference is made of polytetrafluoroethylene and other fluoroplastics, which are becoming so important in the chemical and electrical industries.

The first edition of Modern Plastics was easily the most important book on the subject published in 1945, but one cannot make a imilar claim for this second edition. As a general reference work, Dr. Barron's book will serve a useful purpose.

Gas Leak Detector

INFORMATION of interest to the chemical industry concerning a new gas leak detection method and fluorine chemistry has been declassified and will be made available for commercial applications by the U.S. Atomic Energy Commission, Document Sales Agency, Box E, Oak Ridge, Tennessee. The "halide torch" method of gas detection is the subject of a report by Dr. A. C. Schmidt (Document 2678). The basis of gas detection is the introduction into the gas system of freon or other halogen containing gas which produces a characteristic green flame on meeting a hot copper plate in the test unit burner. American methods of production of elemental fluorine (now costing about $1 lb.) are the subject of Document 2671, "Chambers Works Process for the Manufacture of Fluorine in East Area Carbon Anode Cells" (Dr. A. C. Stevenson).

Technical Publications

ORIGINALLY intended as a refresher course for men of the paint and allied industries returning from the Forces, a series of lectures organised by the Oil and Colour Chemists' Association was delivered in Greater London in 1946. These have now been published in book form as "An Introduction to Paint Technology." The book is divided into four parts: Oil, varnish and lacquer media; pigments; paints, enamels and other pigmented finishes; the manufacture of finishes. It is being distributed at cost price (5s. 3d., post paid) by the OCCA.

* * *

THE character and philosophy of William Backhouse, of Swallowfield, his influence on his spiritual son and heir, Elias Ashmole, and the importance of his place in 17th century alchemy are discussed in the December, 1949, issue of "Ambix," journal of the Society for the Study of Alchemy and Early Chemistry. Other features include the scientific experiments of Sir Walter Raleigh in the Tower of London and the alchemical papers of Dr. Robert Plot (1640-1697).

* * *

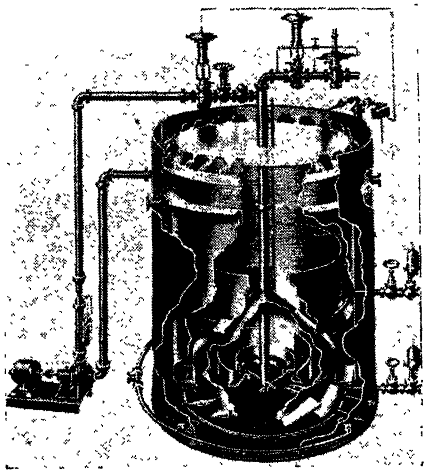
"THERMAL INSULATION" by G. N. Critchley is the subject of Progress Review No. 4 in the January issue of the *Journal of the Institute of Fuel.* Papers on the "Coke-fired Downjet Furnace," delivered at the meeting of the Institute of Fuel in London this week, are also published.

* * *

NEW plant, now in operation, to process powdery iron ore to usable size and to recover iron from blast furnace flue dust is described in the "American Metal Market" (December 24, 1949). Progress of steelmaking during the year is reviewed, and there is a survey of research work in the industry and of refractory and analytical development, improvements in spectroscopy, etc.

* * *

TO aid manufacturers in assessing the costs of producing films the British Engineers' Association and the British Electrical and Allied Manufacturers' Association have published a "Guide to Industrial Film Making." It provides comprehensive information concerning production and includes particulars on distribution, technical film terms, etc. It is supplied by the associations concerned and costs 2s. post paid.



Sectional view showing the ingenious assembly employed in the reaction tank of a new U.S. cold-process slurry type precipitating water softener and coagulator

THE importance of the human side of industry is emphasised in a New Year message for 1950 by Lord McGowan in the January issue of the "I.C.I. Magazine." The first of a series of articles on "Raw Materials of the Chemical Industry" deals with coal, and another feature is devoted to the Nobel Division's Tuckingmill factory. The issue is illustrated with a number of excellent photographs.

Instruments for Canada

BRITISH scientific instrument makers will be well represented at the Canadian International Trade Fair which is to take place in Toronto from May 29 to June 9.

They will combine with other British manufacturers in an endeavour to secure a higher volume of exports to Canada, a market still largely dominated by the U.S.A. In 1948, for example, 58.5 per cent of Canada's total imports came from the U.S.A., as against 11.4 per cent from the U.K.

It is hoped to show that Britain can supply practically all the scientific instruments, previously bought from America, comparing favourably with U.S. goods in quality and price.

PERSONAL

Dr. F. D. Richardson will relinquish his present position as head of the chemistry department of the British Iron and Steel Research Association at the end of the present month, having been appointed Nuffield Research Fellow in extraction metallurgy at the Royal School of Mines, London. This new fellowship is to permit the establishment of an academic research group to work on the extraction metallurgy of both ferrous and non-ferrous metals. Dr. Richardson's team will concentrate on the thermodynamics of slag and metal solutions in extractive processes.

The council of the Institution of Electrical Engineers has awarded the Faraday Medal to Sir James Chadwick, the atomic scientist, to whom was awarded the Nobel Prize for Physics in 1935, following his discovery of the neutron. For his work during the war on the use and control of nuclear energy, he received the United States Medal of Merit.

The retirement is announced of Mr. S. W. A. Wikner, who has been works manager of the St. Anthony's by-product section of the Newcastle-upon-Tyne and Gateshead gas undertaking since 1919. Presentations were made to Mr. Wikner by the officials and works staff. Mr. A. Pillans has been appointed by-products manager in succession to Mr. Wikner.

Prof. W. Davis, M.A., professor emeritus of textiles, University College, Nottingham, has been elected an honorary life member of the Textile Institute. Now living in retirement in Douglas, Isle of Man, Prof. Davis became a member of the institute in 1910, and served continuously as a member of the institute's council and on its committees from 1926 to 1949.

Some 200 members and guests attended the 31st anniversary dinner and social of the Liverpool and North-Western section of the Royal Institute of Chemistry, held in Liverpool, on January 12. The chairman was Mr. J. F. Clark, Liverpool city analyst.

Mr. D. M. Carnegie, Blackheath Park, London, S.E., retired manufacturing chemist, left £59,239 (net personalty £59,064).

The council of the British Engineers' Association last week elected as their president for the current year Mr. Keith Fraser, A.M.Inst.C.E., M.I.Chem.E., who is chairman of the business of W. J. Fraser & Co., Ltd., which his great-grandfather founded. He is also a director of Babcock & Wilcox, Ltd., and Dewrance & Co., Ltd., and a member of the Board of Studies in Chemical Engineering, London University, and of the grand council of the FBI. Vice-presidents are Mr. David D. Walker, joint managing director of Evershed & Vignoles, Ltd., re-elected, and Mr. E. Bruce Ball, managing director of Glenfield & Kennedy, Ltd.

Colonel Victor Dunn Warren, a leading Scottish executive of I.C.I., Ltd., and Lord Provost of Glasgow, has been presented with the Royal Humane Society bronze medal and parchment in recognition of his attempt to save a man from drowning during a fishing trip in Loch Arkaig last May.

Obituary

THE death occurred on Monday at Timperley, Cheshire, of Dr. A. E. M. G. Gillam, D.Sc., F.R.I.C., a member of the Council of the Chemical Society, who enjoyed a number of distinctions in organic chemistry, notably in relation to his work on vitamin A. In the wide field in which he recorded important findings the application of ultra-violet radiation claimed much of his attention and he did much to enlarge the technique of its application to organic materials. He had spent some 15 years at Manchester University, where he became senior lecturer in chemistry in 1946.

Ethyl Alcohol Production

Total U.K. production of ethyl alcohol by the fermentation-distillation process during the distilling year ended September 30, 1949, was 63,981,291 proof gal., states H.M. Customs and Excise. (This includes 11,258,658 gal. distilled in Scotland at distilleries using malt only, and 16,306,785 gal. at distilleries using malt and other materials.)

HOME

I.C.I. Entertains the Children

More than 1000 children of the employees of Imperial Chemical Industries (Dyestuffs Division), Huddersfield, were the guests of the directors at a visit to the pantomime at the Huddersfield Palace Theatre.

More Scope for Soap Boilers

An amendment, as from January 29, of the Soap (Maximum Retail Prices) Order, 1947, re-introduces a number of special brands of hard soap which went out of production during the war. The total amount of soap available to the public will not be affected.

Visits to Laboratories

Final year students from the college of the Pharmaceutical Society and members of the chemical society of Chelsea Polytechnic were among recent visitors to Glaxo Laboratories, Ltd., Greenford, Middlesex. They were introduced to members of the Research Division and shown work in progress.

Borax and Boric Acid Prices

Taking advantage of lower freight rates to this country from the U.S.A., Borax Consolidated, Ltd., has announced a reduction in its U.K. selling prices for all grades of borax and boric acid of £1 per ton as from Monday last. Owing to higher costs of distribution on small deliveries, the surcharges for quantities of less than 3 cwt. have been increased.

Good Week in the Collieries

Britain's coal production last week showed an unusually rapid recovery from the slackening resulting from Christmas and New Year holidays, the production being more than in any equivalent week since 1940. Comparative figures are:—Last week: 4,462,900 tons (deep-mined 4,220,100 tons, opencast 242,800 tons); previous week: 3,715,500 tons (deep-mined 3,528,100 tons, opencast 187,400 tons).

New Source for Newsprint

Bagasse, the waste product of the sugar cane, may prove to be a new means of producing newsprint if tests now being carried out in the U.S.A. prove successful. Investigations by the Kinsley Chemical Company, Cleveland, Ohio, in co-operation with the Chemical Paper Manufacturing Co., Hoylake, Massachusetts, are designed to produce a type of newsprint having the characteristics of stock made from wood pulp.

Duty Exemption

The Treasury has made an order exempting calcium citrate (fermentation) from Key Industry Duty for the period beginning January 14-March 31, 1950.

Better Grease Recovery

The Bradford sewage authority has recommended the acceptance of a tender of £2250 for a solvent pilot plant to produce paler grease in the effluent recovery plant. The lighter coloured product is expected to sell more readily in European grease markets.

E. I. Du Pont Sales Record

Establishing a peace-time record, the 1949 sales of E. I. Du Pont de Nemours & Co., Inc., exceeded $1000 million, J. Warren Kingsman, the company's vice-president has disclosed. Sales in 1948 produced $968,731,000. Large expansion of nylon and synthetic fibres is the keynote of the present and future programme.

£250,000 Plant for Greece

The Stockport chemical engineering firm of Simon Carves, Ltd., has secured a contract worth more than £250.000 to supply sulphuric acid plant to the Hellenic company of Chemical Products and Fertilisers, Ltd., Athens. It was obtained in competition with Belgian, German, and United States firms.

Paraffin Wax Price Increases

Increased prices for paraffin wax and scale were announced last week by Shell-Mex and B.P., Ltd. The new charges per ton, *ex* store or refinery, for paraffin wax of 1-ton lots and upwards are from £68 5s. to £101 17s. 6d., according to grade. (Previous prices were from £50 15s. to £74 3s. 6d.) The price of scale, per ton, is £51 17s. 6d. for 1-ton lots. (£40 17s.) Prices of quantities under 1 ton of both these materials are calculated with an addition proportional to 15s. per ton.

Pollution of Atmosphere Alleged

Dust and smell alleged to come from a new cement works at Pageswood, near Buckley, were the cause of a complaint made at the recent meeting of the Hawarden Rural Council Health Committee. Dr. Cathcart, who was asked to investigate, said that the firm concerned employed an electrostatic process for dust removal. It was not understood how the dust got into the atmosphere; samples of gases were being taken as they emerged from the kiln and went through the dust remover.

Next Week's Events

MONDAY, JANUARY 23

Institution of Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. K. W. Hayes: "Some Aspects of the Stability of Compounded Latex."

TUESDAY, JANUARY 24

The Royal Institute of Chemistry

Slough: Public Library, William Street. 7 p.m. N. Booth: "Careers for Chemists."

Society of Dyers and Colourists

Manchester: 16 St. Mary's Parsonage, 7.15 p.m. G. K. Mecklenburgh (British Nylon Spinners, Ltd.): "The Dyeing and Finishing of Nylon Textiles."

The Plastics Institute

London: Waldorf Hotel, Aldwych, W.C.2., 6.30 p.m. Symposium: "Synthetic Finishes. G. Barnet (Bakelite, Ltd.): "Stoving Phenolic Lacquers"; F. Armitage (Lewis Berger, Ltd.): "Styrene Copolymers"; W. F. Wilson (Cellon, Ltd.): "Cellulose Finishes."

WEDNESDAY, JANUARY 25

The Royal Institute of Chemistry

Manchester: Gas department showrooms, Town Hall Extension, 6.30 p.m. Annual general meeting, 6.45 p.m. Dr. H. J. T. Ellingham (secretary of the Institute): "Professional Chemistry."

Dublin: University College, Upper Merrion Street, 7.45 p.m. E. C. Knight: "Chemical Activities of Micro-Organisms."

British Association of Chemists

London: The Wellcome Research Foundation, Euston Road, N.W.1, 7 p.m. Dr. T. P. Hughes (Royal Aircraft Establishment): "Chemistry in Relation to the Aircraft Industry."

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.15 p.m. (Food Group, Nutrition panel). Dr. W. F. J. Cuthbertson: "The Vitamins: Up-to-date Review."

Society of Leather Trades' Chemists

Manchester: P. Danby: "Pigment Finishing and Aspects of Research into the Problem."

Royal Statistical Society

Birmingham: Chamber of Commerce, New Street, 6.30 p.m. W. A. Bennett: 'Statistical Quality Control Applications."

THURSDAY, JANUARY 26

Sir John Cass Technical Institute

London: Jewry Street, Aldgate, E.C.3, 6 p.m. First of eight lectures to be given on Thursday evenings. Eric Walker (barrister-at-law): "Patents and Industrial Design Protection."

Incorporated Plant Engineers

Sheffield: Grand Hotel, 7.30 p.m. L. W. Lockton: "Some Applications of the Modern Oil-engined Locomotive."

Institute of Metals

Sheffield: Grand Hotel, 6.30 p.m. (with the Sheffield branch of the Electrodepositors' Technical Society). J. C. Chaston: "Silver-Copper Alloys with Special Reference to the Temper-Hardening of Sterling Silver."

Royal Statistical Society

Sheffield: University, St. George's Square, 6.30 p.m. Miss J. Keen (G.E.C. Research Laboratories): "Statistics and the Craftsman."

FRIDAY, JANUARY 27

The Chemical Society

Glasgow: Royal Technical College, 7.15 p.m. Prof. F. S. Spring: "Recent Advances in the Chemistry of the Steroids."

Society of Chemical Industry

London: Chelsea Town Hall, King's Road, S.W.3, 7.30-11.30 p.m. Buffet dance.

SATURDAY, JANUARY 28

Institute of Physics

Cardiff: University College, 2 p.m. (South Wales Branch). W. H. Walker: "Physics in the Mining Industry."

Textile Institute Anniversary

BRADFORD will be the scene of a celebration dinner to be held by the Textile Institute on Tuesday, March 14. The occasion will mark the 25th anniversary of the granting of the Royal Charter on March 11, 1925, and the 40th anniversary of the founding of the Institute on April 22, 1910.

The choice of Bradford for the celebrations is a happy one, for it was largely due to the energy and work of a native of the city, Mr. John Emsley (president of the Institute from 1922 to 1926) that the charter was granted.

Problems connected with the reclamation of fibres will be discussed at a one-day conference on April 18.

◆ OVERSEAS ◆

Pakistan Merchants

The name of the Karachi Indian Merchants' Association (established 1902) has been changed to the Pakistan Merchants' Association.

U.S. Aluminium Production Down

Strikes are said to have been mainly responsible for the decline in output of primary aluminium in the U.S.A. in October. Total production reached only 45,790 short tons, the lowest level since February, 1948. Increased sales during the month reduced stocks to 46,607 short tons. Prices of primary pig and ingot remained unchanged.

Crude Oil for Jugoslavia

Oil supplies from the U.K. to Jugoslavia will comprise 200,000 tons of crude oil in 1950, 150,000 tons in 1951, and 100,000 tons in each of the three following years. This is revealed by the Anglo-Jugoslav trade agreement, concluded last month, under which Britain will supply crude rubber at an annual rate of 2000 tons. The U.K. will receive mainly timber imports.

Indian Atomic Energy Commission

The Government of India has set up an Atomic Energy Commission, which is advised by a Board of Research consisting of nine scientists and by a Cosmic Ray Research Committee. Steps had been taken to conserve thorium and allied deposits in India. The export of monazite, the principal source of thorium, from the shores of Travancore, South India, is prohibited.

Norway's Aluminium

Production of aluminium in Norway last year was expected to total 36,500 tons, and this year production is expected to increase by another 30 per cent, states the bulletin of the Royal Norwegian Information Service, London. The industry does not anticipate any difficulties in selling this increased production. Demand is strong both inland and abroad. In Norway the price of aluminium has been unchanged since 1940.

Successful Synthesis of Mica

The successful synthesis of mica, which may make it possible for the U.S.A. to meet its own needs (it is the world's largest consumer), has been announced by the U.S. Secretary of Commerce. The synthetic mica, crystallised successfully by Dr. Herbert Insley, Alvin Van Valkenburg and Robert Pike, of the U.S. National Bureau of Standards, has essentially the same properties as natural mica, and has a greater ability to withstand high temperatures. The synthesis employs four materials—quartz, magnesite, bauxite and a fluorosilicate compound serving as a crystallising agent and conferring the heat resisting property.

Fluorspar in S.W. Africa

Important mining developments are taking place in the Otjiwarongo district of South-West Africa on behalf of the iron and steel corporation in Pretoria, Iscor. At Marburg Mountains there is an extremely large deposit of low-grade fluorspar which Iscor intends developing. The deposit, known for a long time, has hitherto not been economically workable. Iscor, however, will be able to use certain grades satisfactorily as a flux in steel processing. There is no immediate market for export fluorspar of these grades, but current investigations suggest that an export market may be secured.

British Firms at U.S. Fair

THE size and scope of the first American international trade fair, to be held in Chicago from August 7-19, are indicated by the fact that it will be housed in four different buildings covering nearly 1 million sq. ft.

One of the main purposes of the fair is to help Western European countries to sell their goods in the United States; a large proportion of the space will accordingly be allotted to Western European exhibitors, and a European Trade Fair Board, under OEEC auspices, is being formed to co-ordinate the plans of exhibitors for attracting U.S. buyers.

Dr. J. Kunstenaar, of the U.S. Department of Commerce, has already visited London and had talks with the Board of Trade, with Sir Cecil Weir, chairman of the Dollar Exports Board, and Sir Guy Locock, who is adviser to the F.B.I.

Intending exhibitors may obtain general information about the fair from the exhibition and fairs divison of The Board of Trade, and space can be booked through Mr. A. P. Wales, 16 Shelton Street, W.C.2

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CARBOMETALS, LTD., London, E.C. (M. 21/1/50.) December 12, first deb., to Westminster Bank, Ltd. securing all moneys due or to become due to the Bank; general charge. *£6000. March 10, 1949.

SYNTHELENE, LTD., London, E.C. (M., 21/1/50.) Manufacturers of lacquers, polishes, etc. December 9, £110 and £110 debs. respectively to C. J. N. Etches, Seaford, and C. H. Masters, Hook (Hants.); general charges.

Satisfaction

ANGLO-ARGENTINE GENERAL ELECTRIC CO., LTD., London, W.C. (M.S. 21/1/50.) Satisfaction December 22, of charge reg. August 16, 1949.

New Registrations

Chemicals & Adhesives, Ltd.

Private company. (476,986). Capital £1000. Chemists, oil and colourmen, manufacturers of chemical and other preparations, cements, oils, paints, glues and adhesives, etc. Secretary: D. W. Henley, 144 Bromley Road, Beckenham.

Conimex, Ltd.

Private company. (476,903). Capital £1500. Manufacturers of cleansing materials, preparations and compounds, detergents, etc. Directors: W. E. Hickman-Hill and J. R. Chapman. Reg. office: Eltsac Factory, Low Road, Conisborough.

Staple Essential Oils & Chemicals Co. Ltd.

Private company. (477,045). Capital £2000. Manufacturers of oils, chemicals, aromatic chemicals and compounds, etc. Directors: D. Engel, V. Engel, and M. O'Regan. Reg. office: Sardinia House, Sardinia Street, W.C.2.

Change of Name

The name of Hampstead Insecticides, Ltd., has been changed to H.O.I. Services, Ltd.

Fluorine Case Ended

WITHDRAWAL of the petition of suspension and interdict made by Ben Nevis Distillery (Fort William), Ltd., and Joseph William Hobbs against the North British Aluminium Company was announced last week, thus closing one of the longest court cases in recent years.

Counsel for the petitioners had previously alleged (THE CHEMICAL AGE, *61*, 867) that the Aluminium Company was not making sufficiently rapid plant alterations. The petitioners are now stated to be satisfied with the progress of the remedial work and, according to a statement issued by the solicitors for both parties, all outstanding differences have been disposed of.

Sites for Industry

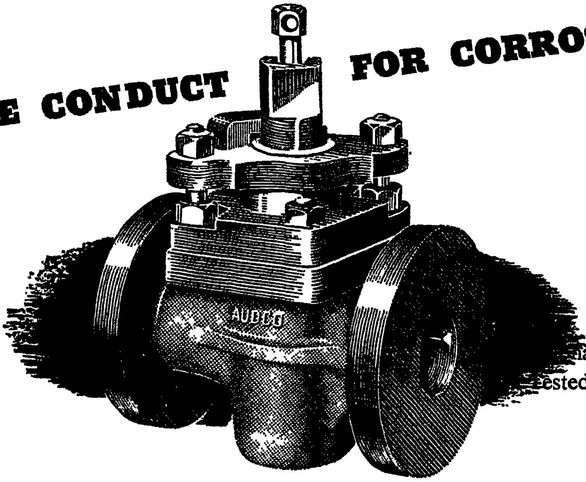
THE facilities for industry in the district round the River Tees are well described and illustrated in a brochure sponsored by the Tees-Side Development Board. It gives an encouraging picture of the work of the board, which has done much to turn Tees-side, until recently a depressed area, into a well-based centre for productions of many different kinds. Everything practicable is being done to prevent a recurrence of the conditions which at one time drove skilled men to other parts of England in search of work. The shipping and docking facilities have been greatly extended, new roads have been built and the excellent water supplies have helped to make the district attractive to light and heavy industries seeking new sites.

Fusion Welded Pressure Vessels

ANNOUNCING the formulation of a new code by the British Standards Institution for the construction of vessels for the chemical and allied industries (THE CHEMICAL AGE, *61*, 907) attention was drawn to the first published specification in the series, "Fusion Welded Pressure Vessels for use in the Chemical and Allied Industries."

It is emphasised by the British Standards Institution that this publication (B.S. 1500) is a provisional standard only and it is hoped that manufacturers will read it critically and submit their comments to the institution. The present standard is not the final form.

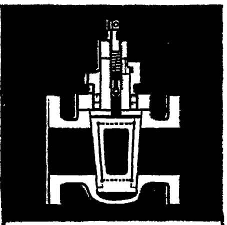
SAFE CONDUCT FOR CORROSIVE FLUIDS



ate Resisting Type S.R.
sted to 100 lbs./□″ Air

For the safe and efficient handling of corrosive fluids,

Audco valves are made in a wide range of corrosion-resisting materials, specially designed to meet the many and varied requirements of the Chemical Industry.



Sectional elevation of Audco Valve with plug in closed position.

AUDCO
Lubricated
VALVES

DIRT CAN'T GET IN—FLUID CAN'T GET OUT

Audco's patented lubricating and plug-seating features ensure positive sealing, certain and easy operation, and low maintenance. The seats are always sealed by lubricant, ensuring rapid and positive closure when required.

Audley Engineering Co. Ltd., Newport, Shropshire

The Stock and Chemical Markets

SPECULATION about the General Election again caused caution and uncertainty in stock markets and buyers have been holding off. Further declines in British Funds have suggested that the big financial institutions may be postponing purchases in the Gilt-edged market. There has been, so far, no evidence of renewed official support for the market from the Government broker.

The downward trend in British Funds has been reflected in the industrial and kindred sections, although most movemovements have not exceeded more than a few pence. The prevailing City view is that if, as the General Election develops, indications should point to a change of Government, industrial shares are likely to show a strong recovery. In the sections threatened by nationalisation, insurance shares have rallied under the lead of Prudential " A " but there have been all-round losses of up to 1s. in iron and steel shares. These, however, were attributable to growing indications that net profits of companies concerned are likely to be affected this year by higher costs.

Chemical shares have been somewhat more active, but at the time of writing have been unable to move against the easier trend of markets. Imperial Chemical have receded further to 41s. 8d., at which there is a yield of a little short of 4⅞ per cent. Monsanto were 50s. 7½d. and yield rather more than 4¼ per cent, Albright & Wilson have changed hands around 29s. 3d., Laporte Chemicals 5s. ordinary around 9s. 4½d., and Fisons around 26s. 4½d., while W. J. Bush strengthened 1s. 3d. at 61s. 8d.

There was a sharp fall in Glaxo Laboratories to 40s., heavy selling having followed the share bonus distribution. In other directions, Amber Chemical 2s. shares were 4s. 6d., F. W. Berk 14s. 3d., Boake Roberts 25s. 6d., and Bowman Chemical 4s. ordinary 5s. 6d. Brotherton 10s. shares have been more active around 19s. 3d., and Pest Control 5s. shares were 8s. 4½d. L. B. Holliday 4½ per cent preference remained at 19s. 9d., and British Chemical & Biologicals 4 per cent preference 18s. 6d. British Glues & Chemicals 4s. shares firmed up to 19s. 3d., British Drug Houses were 6s. 6d., but Boots Drug have fallen sharply to 48s., following news of the share issue on bonus terms, which was regarded in some quarters as disappointing.

Borax Consolidated deferred were steady at 57s. 3d. in expectation of good results and maintenance of the dividend. Lever & Unilever were easier at 42s. 6d. as were Turner & Newall at 73s. 9d., United Molasses at 39s., and the 4s. units of the Distillers Co., then 16s. 10½d. Associated Cement receded moderately to 76s.

Iron and steel shares were affected by fears of growing costs and lower net profits this year, although the probability is that steel production will attain another high record. United Steel have eased to 26s. 3d., Stewarts & Lloyds to 52s. 3d., Dorman Long to 31s., and Thomas & Baldwins to 13s. 3d. Staveley fell back sharply to 79s.

Market Reports

A FAIR amount of activity is reported on the industrial chemicals market and new business has been on a good scale. The price position is unchanged and a strong undertone suggests an upward tendency. Export trade in chemicals and pharmaceuticals has been maintained at a satisfactory level during the past few months and it is expected that the industry will be able to sustain this trade despite the increasing competition in foreign markets. The tar products market is without any special feature and the price de-control has not had any effect on quotations. The restrictions on the day to day merchant business as a result of the nationalisation of the gas industry have taken much life out of the market.

MANCHESTER.—Generally firm price conditions continue on the Manchester chemical market and trading during the past week has been satisfactory in most sections. Contract deliveries of the alkalis and other heavy chemicals to home users are going forward steadily and a fair number of new inquiries have been dealt with. Shippers have again been active in business covering a wide range of products. Basic slag and one or two other sections of the fertiliser market are active.

GLASGOW.—Conditions in the Scottish chemical market have returned to normal during the past week and the supply position has been fairly satisfactory. No particular shortages have been noticed except of those materials which have been in that position for some considerable time. Prices have shown a general tendency to rise.

Slow Development of Spanish Fertiliser Industries

THE anomalous position of the fertilisers industry in Spain which has made extremely difficult the supply of home-produced materials in a market which has never been fully catered for has been well represented in a survey by F. Bustelo Vasques (*ION*, 1949, November, 651-55).

The first company to manufacture synthetic nitrogen fertiliser in Spain, Energia Industrias Aragonesas S.A., was producing 10 tons of ammonia daily in 1918 and required 22 years to reach the stage of paying its first dividend. The Societa Iberica del Nitrogeno, at La Felguera, paid its first dividend in 1947—24 years after it was established. Foreign competition, unmitigated by any effective tariff protection, restricted enterprise, so that supplies during the war were very inadequate. In 1946 Spanish imports of synthetic fertilisers represented 20,000 tons of nitrogen, less than 12 per cent of the estimated national requirement.

Prices of home-produced nitrogen fertiliser have been 20-50 per cent lower than the import prices, yet the home manufacturer has had to contribute to a compensation fund for subsidising imports.

Growing appreciation of the need of a strong and flourishing home fertiliser industry was shown in the official decree of 1940, and in subsequent official declarations, especially those of General Franco himself and of leading Ministers at the Barcelona Chemical Industry Congress in October last. Of the new enterprises which have now been established the three most important are the new factory in Bilbao of the Soc. Españ. de Fabricaciones Nitrogenadas, using coke oven gas of Altos Hornos de Vizcaya; the extensions of the Felguera factory of Soc. Iberica del Nitrogeno and the new plant at Barros; and the new works of Nitratos de Castilla in Valladolid.

Other plants built or in course of erection, especially for calcium cyanamide, are those of the Empresa Nac. Calvo Sotelo, at Puentes de García Rodríguez (La Coruña), and another at Escatrón (Teruel) for gasifying lignites, and at Puertollano (Ciudad Real) in connection with distillation of bituminous shales. By 1952 it is estimated that the total annual capacity of the three principal works mentioned should be 50,000 tons nitrogen, or 30 per cent of natural needs.

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Further particulars from the Secretary, Civil Service Commission (Scientific Branch), 7th Floor, Trinidad House, Old Burlington Street, London, W.1, quoting No. 2887.
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A Word for Technologists

IN the recently issued "Note on Technology in Universities" (THE CHEMICAL AGE, 62, 115) it was not unwelcome to see that the University Grants Committee, in most paragraphs, chose the word *technology*, rather than the older term, *applied science*. That might seem of small importance, were it not for the ingrained custom on the part of a good many authorities of withholding from "technology" the recognition due to a recognisable science. In recent years, more than ever, it has become clear that the practical development of scientific ideas and results is not a lowly and subsidiary pursuit, but an integral field of knowledge with its own broad technique and principles. Any one who imagines that a new product or process is within sight of becoming of practical use when the final creative stage has been reached in research laboratories is a long way from reality.

The word technology is not a pretty word and to many people applied science may still seem preferable. Unhappily the latter term has been debased through the years, a debasement that has been made worse by the recent habit of qualifying "science" by "pure" or "fundamental" to indicate that applied science is not meant. The old tradition that science pursued for its own sake is superior to science put into practice has done quite enough harm without adding the inverse suggestion that applied science is unfundamental. The newer word, which breaks away from all this, is much better.

The University Grants Committee's note merits careful study from the same standpoint. The necessity to provide specialised education in technology in universities as well as in technical colleges will not be questioned. It is already accepted by most universities and expanding facilities have been given. The committee's main recommendation, that we should "build on to what there is" rather than aim at further expansion by creating separate technological institutions within the universities, seems wise—for two reasons. Much of the value of a university education is derived from the intermingling of students following diverse objectives; it is enough that specialisation should balance its own virtues and dangers in lecture rooms and laboratories. The second reason is, at the present time, even more important. The presence and expansion of technological education *in the universities* may bring what is urgently

On Other Pages

Leader:

A Word for Technologists . . 147

Notes and Comments:

Industries and the Election . . 149
Argentina and Germany . . 149
A Year's Chemical Trading . . 149
Study of Servo-Mechanisms . . 150
Better Omens for the BAC . . 150
Planning the Festival of Britain . . 151
Chemicals and Plastics at the BIF 152
Conservatives Pledges to Industry 152
Interchange of Students . . 153
Exports and Imports in 1949 . . 154
Ending Fertiliser Subsidies . . 155
Nuclear Fission of LiH . . 156
New Engineering Groups . . 156
"Berkelium" . . 156
Pestox 3 . . 156
The Programme for Chemical Engineering Research . . 157
The Elements of Cooling Water Control . . 159
Increasing Use of Sodium . . 164
New Patents Judge . . 165
British Petroleum Plant . . 169
Chemicals from U.S.A. . . 169
Petroleum Congress 169
Prices of British Chemical Products 172
Chemical Supplies and Services . . 176

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needed, a greater respect for "applied science" from those who teach and learn "pure science." Ivory towers and red brick (or concrete) should keep within sight of each other.

Like many documents of this kind, the committee's note leaves almost as much to be read between the lines as in them. In more than one passage the prickly subject of status makes a fugitive appearance. The committee has unfortunately left much unsaid. Class distinctions, in whatever form they express themselves, are insidious but very real obstacles to progress. Academic snobbery is a class distinction against which few reformers will venture. The committee has suggested that university courses in technology should be more closely linked with fundamental science; and that the courses in technical colleges should be rather more closely linked with industry's use of science. "Here, again, no difference in status is intended or implied; each type has its appropriate place and special field of usefulness." The committee's high-minded impartiality is not universal. Students, parents and even a good many employers will bear witness to that. Students are to be selected according to their potentialities for technological scholarships to the colleges or the universities. A transfer from a technical college to a university should not be regarded as "in any sense a form of promotion," adds the note.

The committee later deals all too softly with another aspect of status—the relationship between technological study and post-graduate pure research within a university. "We hope that the attraction of a Ph.D. degree awarded for research will not have the effect of drawing suitable candidates away from these courses." To express a hope is hardly an adequate approach. The realistic solution to this dilemma for the youthful is to recognise the equal right of a post-graduate student of technology to acquire a Ph.D. (or even a Ph.T.) degree. The professors and teachers of pure science have exercised too long and too arbitrarily a monopoly in the award of the higher degrees and academic titles. Men who usually can have had very little opportunity to appreciate the amount and quality of scientific thought needed to turn a scientific idea into an industrial fact may continue to withhold merited degrees from men who have devoted years to applied and creative science. To say that it is the man and not his qualifications that matter is airy idealism, even though in the final estimate it is often true. But not every estimate of capability is as well based as that. The committee's hope that "status" will be disregarded leaves the problem where it was before.

Notes and Comments

Industries and the Election

PRE-ELECTION statements of party policies, of which the Conservative contribution was crystallised in Wednesday's publication (*page 153 this issue*), leave little doubt that the issue which will determine the way in which many votes are cast will be the present and future relations between Government and industries. Here is the most direct conflict in which the Conservatives have given unequivocal assurances of their intention to give back to industries the freedom which they used so effectively in the past to sustain living conditions and services, and to relieve some, now State controlled, from the enervating disabilities which impersonal central direction appears to impose. Iron and steel and chemicals are among those which the Conservatives undertake to defend from a like state. The certainty that a Socialist Government would carry to extreme lengths its doctrine of Government direction in industry has now been underlined both by Sir Stafford Cripps's promise (at High Wycombe) of more development councils and the Labour Party manifesto's intimation that in another Socialist economy " The less efficient firms will be helped to raise themselves to the standard of the rest." That is capable of more than one interpretation. It certainly does not exclude the prospect that those undertakings which now operate efficiently and well at a profit, and already carry the largest burden represented by an inflated bureaucracy, may be required to carry also the lazy or inefficient rivals in their own sphere of activity.

Argentina and Germany

RECENT developments in the Argentine point to the re-establishment there of former I. G. Farben interests and the prospect of renewed German influence from a new quarter in the world chemicals and dyestuffs market. The Allied Control authorities have, of course, no jurisdiction over enterprises such as these, which may enjoy in South America fuller facilities than could be found just now anywhere in Europe. Information from Buenos Aires points to the fact that the Government-owned Central Bank of Argentina is giving preferential treatment as regards the allocation of foreign exchange (especially of scarce dollars) to formerly German-owned enterprises, the administration of which had been taken over, a few years ago, by the Dirección Nacional de Industrias del Estado. It is being recalled that last autumn the bank allocated U.S. $2.5 million for imoprts from the Federal German Republic. While relatively little has been allocated to private enterprises, the S.A. Anilinas Alemanas, a former I. G. Farben connection in the Argentine, has just been granted $750,000, one-third to be used for the import of dyestuffs and the remainder for the purchase of chemicals in general from Western Germany. It is expected now that negotiations are to begin to set up a new trade agreement between the Argentine and Western Germany to employ $115 million per annum, instead of the present total of about $55 million.

A Year's Chemical Trading

IN the final accounting of United Kingdom trading with the rest of the world in 1949 chemicals and non-ferrous metals are shown to have maintained a level which, could it be attained in all spheres, would go far to dispose of the balance of payments problem. That conclusion does not depend alone upon the steady rise in value of chemical exports to over £86 million, contrasted with £83.58 million in 1948 and £67.4 million a year earlier. Direct exports of chemicals are, in any case, a very incomplete reflection of the performance of chemical industries, whose contribution has certainly been a substantial factor in the enhancing of value of all U.K. exports in 1949 by £181.9 million to £1558.6 million. While that achievement in the general trading account was overshadowed by the rise of £194.4 million in payments for imports, principally in respect of raw materials (+£89.9 million) and food, drink and tobacco, the improvement in chemical trading is not diminished by a corresponding indebtedness to overseas sources. Chemical purchases in 1949, in fact, were reduced by some £5.4 million, to £25.3 million, and those derived from the U.S.A. last year were down from the £9 million level in 1949 to £6.4 million. Since the effect of devaluation operated only for about a quarter of 1949, it would not be wise to forecast future trading results with the U.S.A. and dollar countries in general by the standard set by these satisfactory results. Manufacturers of America's export chemicals appear confident that there will be no large-scale cuts in U.K. purchases, basing that view on the influence of ECA funds and the growing raw material needs of expanding British chemical industries.

Study of Servo-Mechanisms

THE perplexing liability of sciences and a good deal of technology to lead the practitioner into much wider fields than were foreseen at the start is one of the characteristic problems of current work on automatic control mechanisms. New advances have been made quicker than has been found the means of applying them with full effect to industries, many of which have more or less the same requirements but no means of pooling their information on servo-mechanisms. A good prospect that a group will now be formed to embrace all these interests is seen in the preparedness of the Society of Instrument Technology to form an "undenominational" group of all who are concerned with the theory or practice of closed loop control systems—servo-mechanisms, regulators and process controllers—of which the inaugural meeting is to be held in London on March 28. The Inter-Departmental Technical Committee on Servo-Mechanisms, a wartime creation, still operates, but its objectives are limited. The new group is intended to make good some of the deficiencies, providing a forum for the free discussion of scientific, technical and educational aspects of automatic control methods, not omitting the important factor of the human operator, serving as the controller or supervising the automatic operation.

Better Omens for the BAC

THE lukewarm interest with which a good many chemists appear to regard their only trade union organisation may undergo a change of temperature as a result of some changes announced in the first report in 1950 of the British Association of Chemists. One of the long-standing problems of the BAC has been the tendency of members in outlying groups to overlook the need to preserve and increase coherence among chemists of like interests. There have been reports of chemists—presumably not members of the BAC—joining trades unions having nothing to do with chemistry; and the failure of 300 to pay their subscriptions at the appointed time in 1949 does not bespeak a very lively sense of responsibility among members. A portent of better things in 1950 is the BAC council's decision to release for active service on a wider front the man who knows more about the merits and objectives of the BAC than almost anyone else. Mr. C. B. Woodley, who in March next will have completed 25 years as the association's general secretary, is to be freed from much of the headquarters responsibilities to undertake missionary and other duties in other parts of the country. The BAC also has, in the person of its 1950 president, Dr. Herbert Levinstein, a missionary whose energy and enthusiasm for infusing life into anything of value to industrial chemists and chemistry have been conspicuous in several other spheres.

PLANNING THE FESTIVAL OF BRITAIN

The Rôle of Chemistry and Chemical Industries

THE magnitude of the undertaking contemplated in presenting at next year's Festival of Britain a connected and fairly comprehensive impression of British chemical industries and the things on which they are founded is reflected in some preliminary information relating to the South Bank Exhibition. Much of this is tentative, but it clearly shows that the intention to provide a panorama of genuine educational value, rather than a trade fair, has not weakened. The character of the exhibition will be determined largely by the Festival of Britain staff and the Council of Industrial design, under the overriding control of a presentation panel. The scientific, chemical and industrial exhibits will, however, be shaped by the expert advisory committees, to include such authorities as Sir Robert Robinson, P.R.S., and the industrial organisations, among which the British Plastics Federation will be required to play a very active role. British plastics, materials and fabricated articles and plastics machinery will be represented in more than one aspect of the exhibition.

Chemicals and Sources

The interests of chemistry will be concentrated principally in the Dome of Discovery, where a series of exhibits will represent the development of chemical industries, and the National Resources Pavilion, where will be shown the uses made of Britain's national resources.

The theme of the exhibits in the Dome of Discovery will be the part played by chemistry in the production of familiar articles. It seeks to tell the story from the beginning and to pay full credit to the practical achievements of the alchemists. It will be called to mind, for example, that the distillation technique of the alchemists represents much the same principles as those underlying modern practice. Examples of old apparatus and its modern equivalents will be shown. This demonstration is likely to include representations of some of the relatively primitive processes, such as sublimation, followed by examples of contemporary large-scale crystallisation and filtration.

The beginnings of scientific chemistry will probably be recalled by practical illustrations of basic principles governing such things as the formation of compounds, with practical explanations of how elements enter into the composition of various articles in household use.

It is intended there shall be a large array of exhibits relating to accurate measurement, particularly of weights, which will include analytical equipment and provide for many people their first acquaintance with microchemistry.

A section devoted to atomic theory will serve to reveal some modern applications of the findings of Dalton and Faraday, the latter represented by electrolysis techniques. There will be simple explanations of the structure of molecules and of the determination of the properties of compounds by the arrangement of their elements.

This section will also provide scope for representation of the services of X-ray techniques and crystallography and some indication of the far-reaching importance of such things as the carbon compounds.

Synthesis

It is proposed that a section shall be devoted to synthesis and to the practical uses of the principle of manufacturing organic substances from inorganic materials. This will provide a natural introduction to the subject of plastics. The synthesis of urea is one of the likely subjects here, amplified by modern applications of this material in the plastics industry. This display will necessarily include the organic primaries obtained from coal tar and petroleum. Examples will be given showing progress in British synthetic chemistry. Most suitable subjects are dyestuffs and textiles, with references to colloidal chemistry, surface active agents and detergents.

Drugs, insecticides and vitamins will represent an individual section, and synthetic fibres and monofilaments are also capable of forming the subject of a separate display.

A section concerned with photography is expected to comprise examples of the early work of Fox Talbot, demonstrations of emulsions and other modern equipment and it is hoped to include illustrations of Scotland Yard's photographic techniques in criminology.

The Science Staff of the Festival of Britain and the Council of Industrial Design are still collecting stories of achievement from industries in which chemistry and physics play their part, such as glass, optical glass, rubber, paint, metal founding, etc. It is hoped that all these industries will be fully represented.

In the mineral resources section of the Dome of Achievements the intention is to show various minerals from British territories which contribute to world supplies, and some of the end products. Coal will certainly be very adequately represented, especially in its aspect as a chemical raw material.

In the same section there will probably be displays of precious and semi-precious metals—gold, diamonds and platinum—and such base minerals as copper, lead, zinc, chrome, mica, bauxite, etc.

The foregoing sections will all be located in the Dome of Discovery. Another large pavilion will carry on the story from raw materials to finished products. In the Pavilion of Industry will be featured industries which are entirely British and whose products have a high value as being typically well designed British products.

It is proposed that in this pavilion the plastics industries should be given an opportunity of showing typical British machinery used in the manufacture of their products. It is intended that visitors to the exhibition will be able to see articles actually being produced.

That will require the inclusion of some of the newer extrusion or moulding equipment, much of which has not been shown in public. The British Plastics Federation will be the authority principally concerned with this.

Apart from the exhibits in the Dome of Discovery and Pavilion of Industry, a number of plastic products will be shown elsewhere, appearing in their proper setting in the domestic and industrial spheres, the homes and gardens section, and in the transport pavilion. In fact, there are hardly any sections of the exhibition where they will not be represented.

All plastic products displayed at the exhibition will be finally approved by an industrial panel to be nominated by the British Plastics Federation, to ensure that every article exhibited is technically sound.

Chemicals and Plastics for the BIF

ALTHOUGH the number of exhibitors in the chemicals section at this year's British Industries Fair will again show some reduction, such preliminary information as is available shows that the exhibits will adequately represent nearly all the products associated with the recent important advances in industrial chemistry.

The layout, introduced last year, when the various stands were grouped round a central display by three large companies, has again been adopted, states a correspondent of *The Times Survey of the British Industries Fair*. The section will remain at the left of the main entrance at Olympia.

Many new solvents and plasticisers based on petroleum are now in bulk production, and the range has been extended by the addition of a series of chemicals derived from ethylene oxide.

Among products for use in plastics, the introduction of itaconic acid shows considerable promise, and the same source will offer glucono delta lactone, an easily transportable form of gluconic acid, finding a wide range of applications.

Developments in the rubber industry include latex anti-corrosion compounds for the protection of metal surfaces, and a new preparation for the manufacture of latex foam which obviates the need for prolonged washing of the finished foamed rubber.

Pharmaceuticals will include new penicillin compounds, designed to maintain an effective concentration of penicillin in the blood stream without requiring frequent injections. The new antimalarials will also be in evidence.

The veterinary products will include Antrycide and a recently introduced penicillin bougie for the control of bovine mastitis.

Also of interest will be a series of brown pigments for paints, leather finishes, etc., based on lead chromo-molybdate, an orange pigment claimed to be much superior to the ordinary orange chrome.

A range of very pure metals will be shown, such as germanium and gallium, and their oxides, now being produced in Britain on an industrial scale for the first time.

At Earls Court there will be a combined British Plastics Federation stand, in which 16 firms are participating. The products displayed will include plastics materials and the latest applications, and technical mouldings and components.

There will be some new insulating materials which are non-cracking and non-hygroscopic.

CONSERVATIVES' PLEDGES TO INDUSTRY

"We Shall Bring Nationalisation to a Full Stop"

THE firm intention of the Conservative Party, if returned to power, to arrest the drive to place more industries under State control and to mitigate some of the worst results of the nationalisation already accomplished was confirmed in the party's policy statement, revealed on Wednesday.

The manifesto, "This is the Road," underlines the party's conviction that industry cannot flourish under the conditions of increasing centralisation of control. It says:—

We shall bring nationalisation to a full stop here and now. Thereby we shall save all those industries, such as cement, sugar, meat distribution, chemicals, water and insurance which are now under threat by the Socialists.

Steel Will be Reprieved

We shall repeal the Iron and Steel Act before it can come into force. Steel will remain under free enterprise, but its policy on prices and development will be supervised as in recent years by a board representative of Government, management, labour and consumers.

The nationalisation of omnibuses and tramways will be halted. Wherever possible those already nationalised will be offered to their former owners, whether private or municipal. We shall also be prepared to sell back to free enterprise those sections of the road haulage industry which have been nationalised, and to restore the former system of A and B licences. The limitation of distance on private road hauliers will be progressively eliminated. The present freedom of C licences will remain untouched.

As wide a measure of free enterprise as possible should be restored to Civil Aviation. We shall review the structure and character of the Airways Corporations with that in mind.

We shall drastically reorganise the coal industry as a public undertaking by restricting the duties of the National Board and by giving autonomy to the Area Boards. By decentralising the work of the National Board we shall give greater responsibility to the men on the spot and revive local loyalties and enthusiasm. "British Railways" should be re-organised into a number of regional railway systems each with its own pride of identity and each administered by its own board of direction whose members must have varied practical experience of serving public needs. We shall hold ourselves free to decide the future of the Gas and Electricity Boards when we have had more experience of their working.

The consumer must be given greater protection in the industries remaining nationalised. This can be done by a wider use of independent price tribunals, by stricter Parliamentary control of accounts, by finding time for a periodic review of each industry by Parliament and by subjecting them to examination by the Monopolies Commission or some similar body. Ministers' powers to make appointments will be defined and their powers to give directions will be clarified. Every nationalised undertaking will observe the Workers' Charter.

For coal, electricity and railways there should be separate Scottish boards which will act in concert with the English boards but in no way subordinate to them. We also propose a Scottish Gas Commission, responsible to the Secretary of State, to return wherever practicable and desired, the undertakings to local authorities, either singly or jointly.

The general direction of virtually all the proposals is summed up in these terms: "The policy of the Conservative Party is to restore to our country her economic independence and to our citizens their full personal freedom and power of initiative."

Interchange of Students

MR. J. NEWBY, representing Great Britain, was elected chairman at the third annual conference of the International Association for the Exchange of Students for Technical Experience, which was held recently at the Finland Institute of Technology, in Helsinki. The conference was attended by representatives of Austria, Belgium, Denmark, Finland, France, Great Britain, Holland, Italy, Norway, Sweden. The U.S.A. and Germany were admitted to membership and will interchange students during 1950.

Arrangements were made for the interchange of 1700 students during the summer of 1950; the interchange in 1949 was 1236. The next conference will be held in France in January, 1951, at the invitation of the Direction de l'Enseignement Technique.

EXPORTS AND IMPORTS IN 1949

Chemical Industry's Part in the National Totals

CHEMICAL exports in 1949 once again played an important part in the overseas markets of the United Kingdom. Although the return in December for "chemical manufactures," £3,888,325, was slightly lower than the same month of 1948, the total value of chemicals, drugs, dyes and colours for 1949 was £86,093,728, an increase of £2,512,581 compared with 1948, and £18,692,197 more than 1947.

The relatively small increase in exports this year does not fully acknowledge the credit due to the industry, for the value of imports, totalling £25,331,077, was £5,404,407 less than the figure for 1948.

Details of the export and import figures for December and for the year ended December 31, 1949, compared with the same periods of 1948, abstracted from the *Trade and Navigation Accounts of the United Kingdom*, December, 1949 (HMSO, 6s. 6d.), are set out below.

EXPORTS	Month ended 31 Dec. 1949	Month ended 31 Dec. 1948	Year ended 31 Dec. 1949	Year ended 31 Dec. 1948
	Cwt.	Cwt.	Cwt.	Cwt.
Formic acid	3,189	1.995	35,588	30,130
	Lb.	Lb.	Lb.	Lb.
Salicylic acid and salicylates	116,192	272,706	2,144,325	2,369,930
Value of all other sorts of acid	£91,577	£85,969	£1,099,135	£913.641
	Tons	Tons	Tons	Tons
Aluminium oxide	321	110	4,086	3,841
Sulphate of alumina	2,605	3,087	33,185	34,697
All other sorts of aluminium compounds	665	313	11,674	4,712
Ammonium sulphate	15,668	15,577	262,144	221,044
Ammonium nitrate	4,658	9,045	67,612	97,075
All other sorts of ammonium compounds	1,214	1,186	17,554	17,462
	Cwt.	Cwt.	Cwt.	Cwt.
Bleaching powder	13,652	43,604	319,297	423,519
All other bleaching materials	11,180	9,501	114,438	114,148
	Gal.	Gal.	Gal.	Gal.
Cresylic acid	177,202	253,317	1,445,464	2,565,470
Tar oil, creosote oil, anthracene oil, etc.	3,859,388	3,542,895	35,377,171	37,359,438
Value of all other sorts of tar oil	£71,318	£67,724	£526,042	£575,955
	Cwt.	Cwt.	Cwt.	Cwt.
Collodion cotton	923	2,298	26,035	23,304
	Tons	Tons	Tons	Tons
Copper sulphate	1,612	1,079	38,267	24,524
	Cwt.	Cwt.	Cwt.	Cwt.
Disinfectants, insecticides, etc.	36,810	38,057	524,308	679,952
	Tons	Tons	Tons	Tons
Fertilisers	3,845	3,647	24,730	39,136
	Cwt.	Cwt.	Cwt.	Cwt.
Nickel salts	3,920	6,834	56,406	60,084
Lead acetate, litharge, red lead, etc.	5,618	5,829	70,606	119,546
	Gal.	Gal.	Gal.	Gal.
Tetra ethyl lead	112,862	140,482	1,300,814	1,346,738
	Tons	Tons	Tons	Tons
Magnesium compounds	562	947	8,577	9,947
	Gal.	Gal.	Gal.	Gal.
Methyl alcohol	6,472	9,849	96,474	93,239
	Cwt.	Cwt.	Cwt.	Cwt.
Potassium compounds	5,699	5,829	69,540	100,867
	Tons	Tons	Tons	Tons
Salt	18,278	21,826	215,826	202,509
	Cwt.	Cwt.	Cwt.	Cwt.
Sodium carbonate	257,357	420,472	3,430,569	4,479,833
Caustic soda	252,540	56,826	2,287,417	2,225,404
Sodium silicate	21,131	34,866	302,571	208,496
Sodium sulphate	92,854	14,721	667,756	398,677
All other sodium compounds	89,695	79,326	921,428	955,969
Cream of tartar	288	206	5,081	3,798
Tin oxide	348	641	5,351	7,652
	Tons	Tons	Tons	Tons
Zinc oxide	828	1,771	12,681	14,174
Total value of chemical manufactures, excluding drugs and dyestuffs	£3,888,325	£3,932,961	£45.974,506	£46,498,837
	Oz.	Oz.	Oz.	Oz.
Quinine	142,473	157,094	2,125,784	1,811,991
	Lb.	Lb.	Lb.	Lb.
Acetyl-salicylic acid	134,468	160,482	1,663,030	1,220,237

	100 International Units	100 International Units	100 International Units	100 International Units
Insulin	800,913	1,659,816	12,066,398	10,792,366
	Mega Units	Mega Units	Mega Units	Mega Units
Penicillin	899,261	442,986	7,576,394	4,315,563
Total value of drugs, medicines and preparations	£1,587,859	£1,427,066	£18,371,709	£15,746,351
Total value of dyes and dyestuffs	£644,471	£843,893	£9,956,221	£8,517,937
Total value of paints, pigments, colours, etc.	£921,194	£1,134,849	£11,791,292	£12,818,022
Total value of chemicals, drugs, dyes and colours	£7,041,849	£7,338,769	£86,093,728	£83,581,147
	Cwt.	Cwt.	Cwt.	Cwt.
Plastic materials	41,014	30,016	414,472	385,317
Value	£512,000	£383,080	£5,162,539	£4,702,690
	Cwt.	Cwt.	Cwt.	Cwt.
Chemical glassware	1,404	1,299	14,549	16,926
Value	£54,505	£47,347	£568,623	£578,630
	Cwt.	Cwt.	Cwt.	Cwt.
Fans	7,126	235	56,348	2,123
Value	£160,909	£144,871	£1,537,968	£1,266,888
	Cwt.	Tons	Cwt.	Tons
Furnace plant	9,611	512	84,708	5,435
Value	£127,719	£80,870	£1,088,143	£979,370
	Cwt.	Tons	Cwt.	Tons
Gas and chemical machinery	19,960	1,282	309,072	10,370
Value	£237,850	£319,412	£3,667,812	£2,208,918

Imports	Month ended 31 Dec. 1949 Cwt.	Month ended 31 Dec. 1948 Cwt.	Year ended 31 Dec. 1949 Cwt.	Year ended 31 Dec. 1948 Cwt.
Acetic acid	—	4,353	22,020	225,032
Boric acid	3,250	400	62,859	62,662
All other sorts of acid	889	4,290	41,093	45,601
Borax	12,200	2,400	217,902	249,267
Calcium carbide	—	31,259	47,578	225,907
Coal tar products (excluding benzol and cresylic acid)	20	6	18,427	114,136
Cobalt oxides	268	304	5,721	7,215
	Tons	Tons	Tons	Tons
Arsenic	250	1,200	2,969	7,533
Fertilisers	4,929	4,367	88,272	94,554
	Lb.	Lb.	Lb.	Lb.
Glycol ethers and glycol ether-esters	433,822	10,905	5,365,437	3,769,003
Iodine	75,050	—	753,151	791,784
	Cwt.	Cwt.	Cwt.	Cwt.
Potassium chloride	795,569	556,966	7,914,344	8,760,726
Potassium sulphate	21,140	24,476	418,352	364,184
All other potassium compounds	5,747	1,862	69,659	50,019
Sodium nitrate	120,691	168,225	895,107	907,078
All other sodium compounds	4,940	5,519	60,959	49,084
Carboh blacks (from natural gas)	64,286	28,736	562,447	874,815
Total value of chemicals, drugs, dyes and colours	£2,454,097	£1,945,550	£25,331,077	£30,735,484

Ending Fertiliser Subsidies—Possible Cuts in Consumption

THE Government's decision to remove by July, 1951, all subsidies on fertiliser prices, was described as " a matter for regret " by Dr. Alexander Fleck, chairman of Scottish Agricultural Industries, Ltd., at the company's annual general meeting in Edinburgh last week.

Dr. Fleck observed that the removal of the subsidies would increase the cost of fertilisers to farmers by something like 50 per cent. Although this increase would be balanced, in whole or in part, by a compensating adjustment in farmers' crop realisations, " such a sudden and large rise " might well have the effect of discouraging farmers from maintaining or increasing the present level of fertiliser consumption. The greatest possible utilisation of fertilisers was essential, the chairman said, to the fulfilment of the plans for expanding the nation's agriculture.

There was a special need for the company to conserve resources to finance stocks and debtors at much higher values; the company's responsibility would be to do everything possible to promote the efficient use of the optimum amount of fertilisers, despite the discouragement of a much higher price scale.

" The need is clear," said Dr. Fleck, " and we will use all reasonable means at our disposal to help farmers to meet the difficult circumstances."

NUCLEAR FISSION OF LiH

Not a Source of Industrial Energy

THAT the potentialities of the nuclear fission of hydrogen-lithium, should they be developed, are purely military is the view of Dr. Hans Thirring, the Austrian physicist, who has stated that he does not believe that the energy released can be harnessed for industrial purposes.

Dr. Thirring told *The Times'* correspondent in Vienna that the power of the plutonium bomb could be greatly increased if plutonium were used to set off a chain reaction in some other more easily accessible and cheaper elements. Closer study showed that if a combination of hydrogen and lithium were detonated it would theoretically release some 29 million kWh of energy per lb. of material, as compared with 11.3 million for the same quantity of uranium-235 and 2.2 million for a "heavy hydrogen bomb."

Although the specific amount of energy released in the hydrogen-lithium bomb is only twice that of U-235, a super bomb with a thousand-fold destructive power might be made from hydrogen and lithium for the simple reason that it is available in enormously greater quantities than either plutonium or U-235.

The nuclear reaction which released the energy of the LiH bomb—that was the formation of two alpha particles from a lithium nucleus and a proton—did not occur as a self-sustained chain reaction like the fission process in uranium, but was a process which could be started only at a very high temperature of several hundred million degrees.

Hence it seemed to be very likely that any LiH super-bomb would have to be fitted with a core consisting of an ordinary atom bomb to serve as a kind of detonator. That was why the number of super-bombs would probably in practice, be restricted by the amount of available fissionable material—namely, plutonium and U-235.

"Berkelium"

THE University of California has announced that its cyclotron has produced a new element, which is said to be the heaviest known—it is No. 97 in the atomic scale. Its discoverers are Dr. Stanley G. Thompson and Mr. Albert Thorso, research associates of Dr. Glenn T. Seaborg, professor of chemistry at the university and co-discoverer of the four other new elements. The newest element has been tentatively named Berkelium.

NEW ENGINEERING GROUPS

Servo and Engineering Equipment

AN attempt is being made, under the auspices of the Ministry of Supply and the Society of Instrument Technology, to bring together those who are interested in the scientific, technical and educational progress of automatic control mechanisms.

An inaugural meeting of a section formed by the Inter-departmental Technical Committee on Servo-mechanisms and the Society of Instrument Technology will be held in London on Tuesday, March 28 at 6.30 p.m. at the Royal Society of Tropical Medicine and Hygiene, Manson House, Portland Place, W.1.

The following papers will be read: Prof. K. A. Hayes, "Servo-mechanisms—Recent History and Basic Theory"; Dr. A. Utley, "The Problem of Stabilisation"; Prof. A. Tustin, "Problems in Control Systems which await Solutions."

It is hoped that the support by persons interested in control mechanisms and allied subjects will be sufficient to warrant the formation of a control section within the framework of the Society of Instrument Technology.

Standardisation of Equipment

A new association, the Engineering Equipment Users' Association, to provide a means for exchanging information on the standardisation of engineering equipment which they use in common, has been formed by five leading British companies in the process industries field. The founders are: Anglo-Iranian Oil Co., Ltd., Courtaulds, Ltd., Imperial Chemical Industries, Ltd., Lever Brothers and Unilever, Ltd., and Shell Petroleum Co., Ltd.

Brig. L. F. S. Dawes has been appointed secretary of the association, which will work in collaboration with the British Standards Institution. The offices are at 20 Grosvenor Gardens, S.W.1.

New Insecticide : Pestox 3

Attention is called to the inadvertent use of the term "Bisol 3" in one passage in a recent commentary on the successful results of full scale tests of Pestox 3, the new systemic and selective insecticide based on an organic phosphorus compound. Pestox 3 (bis (bis dimethylamino phosphonous) anhydride) is produced by Pest Control, Ltd., Cambridge.

[Bisol has been used as the registered trade mark of British Industrial Solvents, Ltd., since 1930.]

THE PROGRAMME OF CHEMICAL ENGINEERING RESEARCH

British Scientists' Lead in Fundamental Work

By A SPECIAL CORRESPONDENT

BRITAIN, in comparison with other leading industrial countries, has been slow in developing the applications of chemical research, regardless of the fact that in fundamental research the record of British scientists is second to none. The adoption by investigators in Germany or the United States of discoveries originating in the U.K. and their development to the production stage has been a fairly common phenomenon.

The relative lack of progress in these more practical activities has been attributed in part to the limited extent of Britain's chemical engineering industries, deeply involved as they are in supplying adequately the day-to-day needs of industries. In the U.S.A. the development of these industries and their plant research programmes has been stimulated by the requirements of a huge oil industry. Germany, too, has been critically dependent on research chemists to solve supply problems resulting from the inadequacy of essential raw materials.

Practical Applications

Britain has in recent years awakened to the realisation that only by the application of research to practical problems can industrial leadership be maintained. The existence of the Department of Scientific and Industrial Research and the recent acceleration and widening of its activities are sufficient evidence of the changing outlook upon this subject. In these national research programmes chemical engineering science in its many branches will be accorded a prominent place, not only because of the close links between chemistry and engineering, but also because of the rapid expansion of Britain's chemical industries.

The development of chief potential importance was the establishment early this year of the committee set up by the Advisory Council to investigate the entire field of chemical engineering research in Britain. It is the task of this committee to find out what Britain needs most in the field of chemical engineering research and how far these needs are met by existing facilities, and to suggest the establishment of further facilities.

The committee itself is satisfactorily representative of organisations throughout Britain which are concerned with applied chemical research. The DSIR, with its 40 associations and 14 stations, receives all the evidence it needs of the developments bearing on chemical engineering research. Mr. H. W. Cremer, chairman of the committee, was lately president of the Institute of Chemical Engineers. Industry is represented by several members, including Mr. J. Davidson Pratt, a director of the Association of British Chemical Manufacturers, also by a representative of the British Chemical Plant Manufacturers' Association.

Liaison With Universities

The universities are associated with the committee through Prof. D. M. Newitt, of the Imperial College, Prof. F. H. Garner, of Birmingham, and Prof. T. C. R. Fox, head of the chemical engineering faculty at Cambridge, which was started last year—the first faculty of its kind to be established at the older universities.

The field for the committee's investigations is extremely wide. Chemical engineering research is so closely linked with chemical research, physics, metallurgy and other associated sciences that no clearly defined lines of demarcation can easily be laid down.

One of the prime objects of the survey is to ascertain what methods are being employed to make practical use of available knowledge, and what chemical engineering research is necessary to follow up an idea to the production stage.

The Production Stage

Research is at present being carried on at the universities, at the stations of the DSIR, in the research associations, and in numerous industrial establishments. In fact, much more is being done in this direction than is generally realised, although at this stage no complete picture can be given of the results that may be expected.

These fields of research have received an enormous impetus from industry derived from the new petroleum-chemical plants of the Manchester Oil Refineries Group, Shell Chemicals, I.C.I., Ltd., and British Petroleum Chemicals in Scotland. The associated or independent oil refineries being erected, such as the Anglo-American project at Fawley, Southampton, and the extension of the Anglo-Iranian group's operations at Llandarcy are providing parallel fields providing new scope for chemical engineers.

All these undertakings constitute a new and very large section of the chemical industry which was predominantly American in the past, mainly because Britain had no domestic oil industry, so that technological "know-how," apart from the Anglo-Iranian refinery at Abadan, was largely in the hands of Americans.

Britain's Refineries

While British scientists and engineers have developed a large number of heavy chemicals and fine chemicals plants, and manufacturers have been selling oil equipment, the men on the spot with first-hand experience of the actual applications of the latter plant were frequently operating outside this country. Now that Britain has a rapidly growing refinery industry of her own, British scientists and engineers will have opportunities on a scale never offered before to keep in the forefront of oil technology and of the associated chemical engineering practice.

In the fields of oil and synthetic oil, the DSIR's interest is centred mainly in the Fuel Research Station at Blackwall Lane, Greenwich.

A good example of the dependence of chemical engineering for its basic data on physical and chemical research is afforded by investigations into hydrocarbons which are being carried out by Birmingham University, in co-operaton with some of the major oil companies.

Common Fundamental Patterns

Co-ordination of research is also being accorded increased attention. During the past year the DSIR has been conducting a survey on drying processes and is getting together a bibliography on drying. They are being aided in this task by the Ministry of Fuel, whose Regional Fuel Engineers are attempting to ascertain the fuel efficiency of the various drying equipment used in industries.

While the Ministry of Fuel is approaching the problem from the standpoint of plant and fuel efficiency, the DSIR is trying to discover whether there is a common fundamental pattern in drying which can be applied to all industries. In other words, they aim to find out whether knowledge of drying a particular material obtained by one industry could be used for assisting the development of plant for another industry. In the past there has been little attempt to co-ordinate this knowledge, each industry regarding its own problems as unique. Henceforth, there will be a pool of acquired knowledge and experience from which any industry can draw. A very large number of references have already been acquired.

On the metallurgical side, various organisations, such as the British Iron and Steel Research Association, the British Cast Iron Research Association and the Non-Ferrous Metals Research Association, in conjunction with the National Physical Laboratory, are making contributions to physical knowledge which are of great interest to chemical engineers. Useful contributions are now also to be expected from the work of the Ceramics Research Association at Stoke-on-Trent, certain aspects of which have a close bearing on chemical engineering.

Even more practical work in applied research is, of course, being done by independent organisations, such as the Amalgamated Research and Development Corporation, Messrs. E. Mactaggart and the Fulmer Research Institute.

Link With Mechanical Engineers

Britain's new mechanical engineering laboratories to be established at East Kilbride will be closely associated with chemical engineering research. A separate building is to be erected for research in the field of heat transfer. It is believed that this will be the first laboratory in the world to concentrate exclusively on this subject. The study of hydraulic machinery and of such subjects as mechanics of solids and properties of materials generally will provide a mass of fundamental data for the use of the chemical engineer.

Incomplete though it remains at present, the picture is indeed encouraging, for it is evident that a very large and comprehensive programme of chemical engineering research is gradually taking shape.

A fundamental defect of research work in the past has been the lack of organised general publicity in Britain, which is doubtless one of the main reasons for the tendency to underestimate the existing facilities for research of all kinds This contrasts with the United States, where a great deal more publicity is given to the achievements of chemical research.

THE ELEMENTS OF COOLING WATER CONTROL

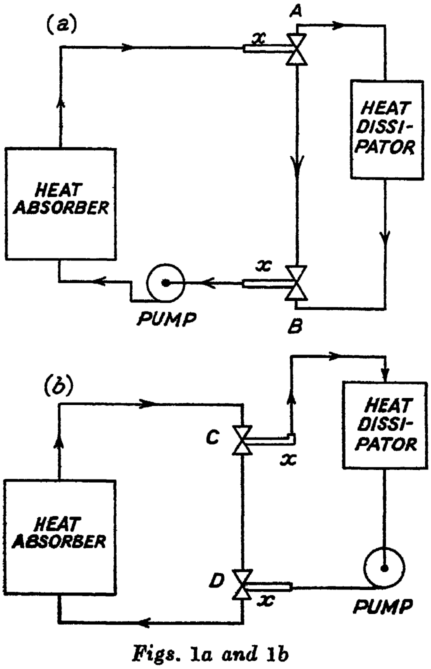
Automatic Regulation of Thermal and Flow Values

by LEO WALTER, A.M.I.Mech.E., etc.

MORE water is used in industry for cooling than for any other purpose, and by automatically controlling its consumption a great amount of water can be saved. That, of course, is not the only saving that automatic control of flow by instruments can confer. Other advantages likely to result include improvement of quality of production, increased output, saving of fuel and power by reducing the load of cooling pumps.

By recirculating water and automatic admixture of fresh water in the right quantity, water cooling can be performed where raw water is scarce, or where water treatment must be reduced. The demands on spray ponds or cooling towers may be relieved by automatic control and the use of controlled recirculation, and the cost of cleaning mains and plant may also be considerably reduced.

The first step towards taking advantage of automatic control is obviously to find out how much water is used by each individual plant. Measurements or calculations in one form or another, are inevitable. The essential measuring instruments are reliable rate of flow meters, pressure gauges, and thermometers.



Figs. 1a *and* 1b

Cooling water can sometimes be saved by reducing the head at which water is pumped throughout a works. This will in itself reduce excessive consumption at certain plant equipment, but will still leave much scope for automatic temperature regulators for reducing the quantity of cooling water used.

It is usually possible to estimate the rate of flow of cooling water in pipes by calculations, employing the methods and formulæ to be found in the text books. It can therefore be assumed that the minimum, average and maximum rates of flow to each individual plant equipment is known.

Automatic Temperature Control

Cooling water, wherever it is used, must be delivered to plant equipment at a definite temperature and in a definite volume (rate of flow), in order to meet the varying requirements of the plant at any moment. "Cooling balance" can obviously be achieved only where dissipation of heat is performed so that the flowing water carries off just sufficient BThU to keep the process temperature steady.

This applies generally to all industrial cooling problems, whether using an open or a closed circuit, and " gradual " or " metering " control is the type sought. Thus preferable for cooling water control are " throttling " controller types, in which the control valve moves gradually to increase or reduce the rate of flow, according to the demand. There are some instances where on/off method of control is applicable, having the control valve in the cooling water supply, opening or closing fully, according to water temperature at the point of use. The effect, more drastic and abrupt, serves well enough in processes in which small plus or minus temperature effects of short duration can be tolerated.

Another important method of automatic control has already been mentioned in connection with use of recirculation, namely, water blending. Mixing valves or thermostatic blenders can be used with advantage, or thermostatic 3-way diversion valves for admixture of fresh raw water to warmer return water, or for diversion of part of the return water from the cooler.

The layout of a typical self-actuated automatic mixing valve or blender installation is shown diagrammatically in Fig. 1a, and of the thermostatic diversion valve in Fig. 1b (p. 159). In each case two heat exchangers are used with a by-pass between them, a method of cooling water control which has the decided advantage, over the throttling method of control, that the actual flow volume is always the same. Temperature control is performed not by changing the rate of flow, but by varying the temperature of a constant rate of flow.

Fundamental to any such heat exchangers are the heat absorber and the heat dissipator. The heat absorber may be an engine jacket, a cooled furnace door, or chemical condenser; the heat dissipator can be a cooling tower, a water cooler, or a refrigeration plant. A suitable circulation pump is required in both layouts for movement of the cooling water, and in both illustrations the single connection of the 3-way valve must come on the delivery side of the pump.

In positions B and C, control is performed by means of water mixing (blenders), whereas in positions A and D the 3-way valve is acting as a by-pass, or diversion valve, proportioning the flow through and around one of the heat exchangers. The only difference in the two diagrams is that the direction of flow in the by-pass has been reversed.

It should be noted that in some layouts the second heat exchanger does not exist and the outlet on one side of the blender or diversion valve discharges to "waste." That, however, is not always the drain; it is likely to be part of another plant equipment, such as a hot water tank, where the heat is useful.

Automatic control and dissipation of heat is not always easy, ranging from very simple throttling control to elaborate programme control. The type of regulator and the mode of control chosen, depend on the purpose, working conditions and plant design. The deciding factor is the amount and the rate at which the process temperature changes with change of rate of cooling. In other words, the rate of cooling load required, and the change of this rate for keeping process temperature steady are factors which influence choice of controller type.

Where the cooling rate of a process is steady, or varies only slowly and in small amounts, the control problem is obviously simple. Frequent and heavy changes of cooling load complicate the control problem, and require more responsive and more adaptable types of cooling controllers.

Inertia of cooling water flow retards the effect of throttling, blending or by-passing. Such delays are the " process time lags." They are characteristic of the cooling process, and often influence accuracy or close-

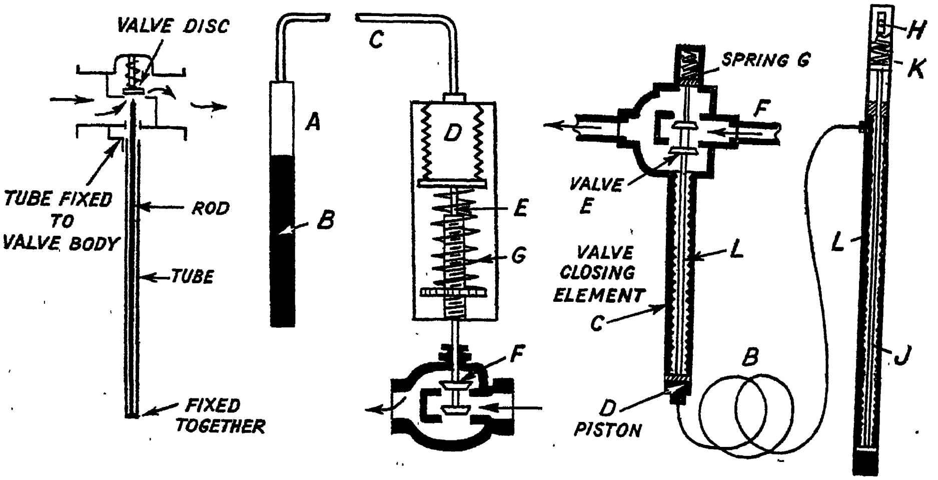


Fig. 2

ness of control much more than controller characteristics (instrument qualities).

Flow velocity of cooling water through a heat exchanger is necessarily one of the largest influences determining the amount of heat that can be carried away. In other words, the heat transfer factor of a heat exchange surface depends not only on design of the jacket or coils but also on supply pressure and the diameter of the cooling water pipe.

Design of Regulators

The great majority of cooling water controllers are of very simple design, and belong to the self-operating type. There are, however, cooling problems, mainly connected with chemical reactions, which require more elaborate, power-operated temperature regulators, employing for their operation compressed air or water under pressure. Where on/off mode of control is applicable, electric thermostat- or pressurestat-switches are used, acting on solenoid valves, motorised valves, or *via* a relay on motor starters for pumps.

Operating Principles

The main characteristics of the operating principles of various systems of thermostatic temperature control are worth studying. They include these:—

Metal (or Metallic) Expansion.—Automatic movement is provided by the heat expansion of metals. The movement is small but powerful. Response to temperature change is comparatively slow; suitable for medium temperatures.

Bi-metal.—Automatic movement is provided by the effect of heat on two strips of dissimilar metals, in close contact and having different rates of expansion. When heated they expand with a bending movement, one metal expanding more rapidly than its partner. There is average movement and medium power. It responds quickly to temperature change, but is suitable only for low temperatures.

Vapour Pressure.—Automatic movement is provided by the expansion of the vapour given off by a liquid when brought to boiling point. There is average movement and medium power. It responds quickly to temperature change and is suitable for medium temperatures.

Liquid Expansion.—Automatic movement is provided by the heat expansion of a liquid. There is ample movement and considerable power. This is suitable for medium temperatures.

Resistance-Thermometer and Thermocouple

The electrical resistance of a wire varies with changes of temperature. Change of resistance can be translated into movement for control purposes. Thermocouple movement is produced by the effect of heat on two parallel wires of dissimilar metals, fused together at one end. When the fused tips are heated a minute electric current is generated which brings into play a second circuit having sufficient

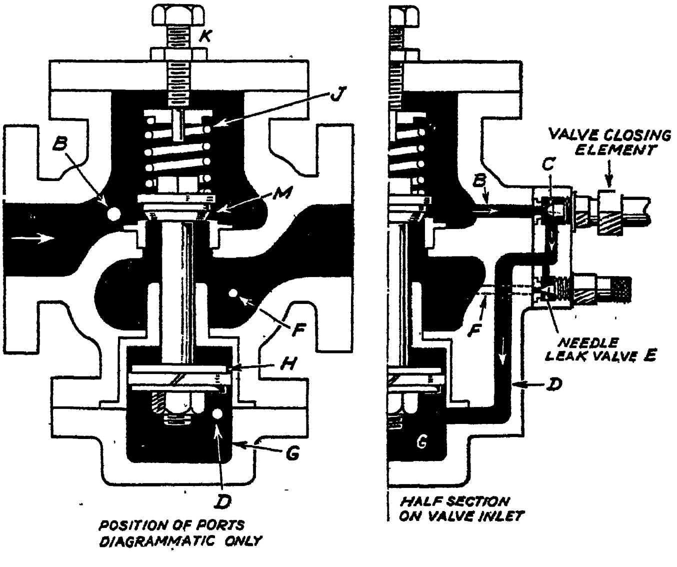

K
J
B
M
F
H
G
D
POSITION OF PORTS DIAGRAMMATIC ONLY
VALVE CLOSING ELEMENT
C
B
F
NEEDLE LEAK VALVE E
D
G
HALF SECTION ON VALVE INLET

Fig. 3

A common pilot controlled, piston operated control valve, shown here in diagrams, incorporates these essentials: B, D, F ports cast in the body; C pilot valve; E leak valve; G piston chamber; H piston; J and K spring and tension regulator power to operate the regulator. This affords very quick response to temperature change and is suitable for high temperatures.

Practically all the makes and types of temperature control apparatus on the market utilise one or other of these basic principles of thermostatic control.

Types of Controllers

A temperature controller is "self-actuated" when the movement generated in its thermostat is sufficiently forceful to be transmitted directly to the valve, tap or switch in the supply line.

A temperature controller is "power-operated" when the movement generated in its thermostat is not sufficient to perform the same operation. In such cases the thermostat movement operates a pilot valve or relay switch, which brings into operation auxiliary power (compressed air, electricity, oil or water under pressure). Much larger valves or switches may thus be operated than would be possible by direct movement from a thermostat and more powerful and responsive thermostats are practicable.

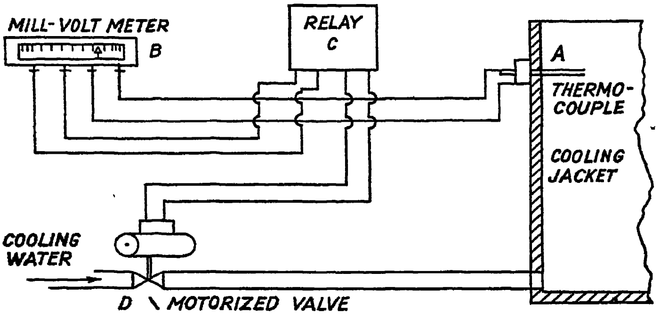


Fig. 4

It is not intended to describe in detail the numerous designs or the more common thermostats, because they can be found in makers' literature and in other literature, cited later in the bibliography.

Fig. 2 shows diagrammatically various self-actuated temperature regulators, consisting of the rod and tube type, the vapour-actuated regulator and the liquid filled regulator. A very common type of control thermostat is the self-actuated pilot-operated type (Fig. 3). Power is derived from water pressure, varied by means of a pilot valve operated from the temperature detecting element, according to demand for cooling. This type is very familiar to plant engineers. Electric thermostat switches do not call for detailed description. Either a bi-metal strip or a coil bends or unbends with change of cooling water temperature, thus making or breaking an electric circuit, or filled capsules or bellows expand or contract. It is characteristic of all temperature controllers for cooling purposes, that the control valve opens with rising process temperature, and vice versa. This valve type is usually called "reverse-acting."

Electric resistance thermometer-controllers and thermocouples can be used for gradual electrical control methods. Fig. 4 shows a thermocouple control system using the following principle:

(A) is the temperature sensitive element (thermocouple). The fused tips of the thermocouple are in the cooling space, exposed to change of cooling water temperature. The voltage of the consequent electric current produced is in proportion to the heat being dissipated. The free ends of the thermocouple are connected to a sensitive millivolt meter (B), thus making a circuit. The system then is completed with the relay (C) and the electrically operated valve (D) in the cooling water supply.

When the thermocouple is acting as a thermostat controlling the operation of a valve, the minute electric current, generated by the couple when cooled to a certain temperature, brings into play a second circuit which supplies the voltage required to operate the regulating valve by means of an electric relay. The thermocouple is very sensitive and shows a quick response to temperature change, but the power it can generate is measured in thousandths of a volt.

(*To be continued*)

Lower Aluminium Prices

The installation of improved rolling mill equipment is cited by the British Aluminium Co., Ltd., as the factor which has enabled it to reduce prices for the thinner gauged materials. For sheet, coiled strip and circles, reductions for basic quantities are from ½d. to 7½d. per lb., according to thickness. Prices for Rigidal corrugated aluminium sheets are also reduced.

The Chemist's Bookshelf

HIGH POLYMERIC CHEMISTRY. W. S. Penn, 1949. London: Chapman and Hall, Ltd. Pp. 487. 36s. net.

The author of this book expresses the hope that it will become a standard textbook and work of reference, both for students and those engaged in research. It is therefore disappointing that, although the author deals enthusiastically with a vast number of topics, he does not often give the impression of having direct practical contact with the chemistry concerned, and his work as a whole lacks the authority, depth, and sense of balance needed in a textbook.

To some extent the title is misleading, for several chapters are partly concerned with technology, particularly of plastics and rubbers, and the author evidently assumes his readers to know something of these subjects. Technical terms occur frequently; tables of properties from the technical literature are reproduced; compounding recipes are included; and most of the photographs illustrate the manufacture and uses of plastics. A rather arbitrary selection of the patent literature is cited. Some patents are treated with more respect than they deserve, while others, which have been landmarks in the industrial development of polymers (*e.g.*, the I.G. diene emulsion interpolymerisation processes) receive no acknowledgment.

About one-quarter of the book is devoted to physico-chemical topics, such as polymerisation mechanisms, molecular-weight measurements, and relation of physical properties to structure. These sections are descriptive and free of mathematics. It is surprising to find almost no reference to that familiar feature of modern polymerisation theory, initiation by a free radical from the breakdown of a catalyst molecule. Most of the remainder of the book describes various high polymers, grouped according to chemical type. Their presentation is influenced by the author's views on commercial utility, and on the whole he has struck a fair balance between the various subdivisions.

Both chemical and technological specialists are likely to disagree with some of the data and opinions presented in these chapters. For example: in discussions of emulsion polymerisations the BIOS reports and the results of recent American research are practically disregarded, yet the rather misleading treatment of the subject in Mark and Raff's textbook is once more quoted; redox polymerisation is presented mainly in terms of German and American rubber technology, without discussion of the theory of the subject contributed by British chemists; the so-called " allyl " plastics are discussed apparently without recognition that they are thermo-hardening because their monomer molecules contain two double bonds. The recent redox data share an appendix with older data on Friedel-Crafts catalysis, which should have been in the main text.

The many subjects discussed are kept in order by a numbered decimal system of paragraphs, but this does not prevent considerable repetition. The text is marred by many printer's errors and mistakes in chemical names and formulæ. In naming chemical compounds, the author uses dots, hyphens, numerals, capitals, etc., quite haphazardly; many readers may also dislike the colloquial style in which some passages are written. Abundant data and references are the best features of the book.—R.G.R.B.

Petroleum Products

THE increasing importance attached to petroleum derivatives and their industrial application is reflected in a series of six lectures on " Special Products from Petroleum " to be given at the Sir John Cass College, London, beginning on Thursday, March 2. The chair for the whole course will be taken by W. S. Ault, who will also deliver the first introductory lecture.

Remaining lectures, which will be given on Thursday evenings at 6.30 p.m., will deal with: " Corrosion Preventive Compounds," W. Pehl (March 9); " Metal Working Lubricants," W. H. Adams (March 16); " Electrical Oils," V. Biske (March 23); " Technical White and Medicinal Oils," G. H. Harries (March 30); and " Petroleum Waxes and Petrolatums. Aromatic Extracts," S. T. Minchin (April 6). There will be questions and discussion.

Increasing Use of Sodium

Adaptability as a Reducing Agent in Organic Synthesis

From A SPECIAL CORRESPONDENT

SODIUM is fast becoming one of the most important reducing agents available to the organic chemist. Substantial and increasing quantities of the metal are to-day being used for the reduction of fatty acids to alcohols in the preparation of synthetic detergents; reduction of ketones and ester-ketone mixtures to glycols; reduction of carboxylic acids into aldehydes and reduction of nitriles to form high molecular weight primary and secondary amines.

Producing Organic Chemicals

Although now the largest single use of sodium is in the manufacture of tetraethyl lead it may well be that within a few years a greater tonnage of the metal will be employed as a reducing agent in the manufacture of a wide range of organic chemicals.

In the production of fatty alcohols secondary alcohols are usually preferred to either primary or tertiary alcohols; the former react too easily with sodium and tertiary are too sluggish in their reaction. The secondary alcohols, on the other hand, are more easily controllable. Choice of alcohol is, of course, determined by several factors, notably cost, availability, ease of recovery and solubility of the intermediate products.

In the reduction of the triglyceride esters present in coconut oil methyl amyl alcohol is often used. The process involves treating the oil, which largely consists of the glycerides of lauric and myristic acids with smaller quantities of oleic, stearic, palmitic, capric, caprylic and caproic, with metallic sodium and adding the reducing alcohol as fast as it is consumed by the reaction. In these conditions quantitative yields of fatty alcohols in the form of their sodium salts, are obtained, together with the trisodium salt of glycerine and the sodium salt of methyl amyl alcohol.

The present industrial method is, of course, a logical development of the familiar ester reduction process discovered by L. Bouveault and G. Blanc (Ger. Pat. 164,294 (1903)). The original method had the disadvantage of requiring a large excess of sodium, the bulk of which was lost by reaction with water and therefore ineffective in so far as the reaction was concerned.

In the production of glycols use has been made of a process described by Chabiay (*Comp. rend.*, 156, 1021 (1913): *Ann. Chem.* (9) 8216 (1917)), which entails the reduction of an ester with sodium and liquid ammonia in absolute alcohol, *e.g.*, dimethyl sebacate will give decamethylene glycol. Another method of preparing glycols by the use of sodium entails the reduction of mixtures of ketones (Wieman, *Comp. rend.*, 212, 764-5 (1941): *Chem. Zentr.*, 1942, I, 2123).

Good yields of aldehydes can be produced from carboxylic acids, *e.g.*, from salicylic acid it is possible to obtain 64 per cent of salicylaldehyde which is an important raw material in perfume manufacture. This reduction makes use of the sodium amalgam method of Weil and Marcel (*Ber.*, 55, 2664 (1922)) and subsequent development by Davies and Hodgson (*J. Soc. Chem. Ind.*, 62, 128 (1943)).

Formation of Amines

The reduction of nitriles to form high molecular weight primary and secondary amines makes use of metallic sodium, *e.g.*, dodecylamine and tetradecylamine can be produced from the respective nitriles as described by Kraft (*Ber.*, 23, 2360 (1890)). The amines, which are generally isolated as their salts, must be treated with alkali hydroxide to obtain the free amine. By reducing fatty nitriles with sodium and alcohol excellent yields of primary amine without secondary amine formation can be secured; with other standard methods involving hydrogenation some secondary amine is invariaby formed.

The interesting dibasic acid, pimelic acid, can be made by the action of sodium and isoamyl alcohol on salicylic acid, guaiacol carboxylic acid, or anthranilic acid. The reaction is comparatively simple and good yields are obtained. It represents an improvement over more conventional methods, *e.g.*, from pentamethylene dibromide through the cyanide process.

Heat Resistant Ceramic

A new ceramic material, "Stupalith," combining lithium, aluminium and silica, capable of withstanding a heat shock of at least 2000°F., has been developed for the United States Air Force for jet engines and other applications.

· PERSONAL ·

MR. J. F. R. JACKSON has been appointed director of research of the recently formed research and development division of the British Steel Founders' Association, Sheffield. He was formerly chief metallurgist and technical controller in the foundries of David Brown & Sons (Huddersfield), Ltd., gear wheel and steel castings makers. Mr. Jackson will be mainly concerned with relating scientific knowledge and steel foundry practice for the improvement of production and technique.

SIR HENRY DALE has been elected presi dent of the British Council in succession to Lord Riverdale, who has resigned for private reasons. Sir Henry was a member of the council's executive committee from 1942-1949, and chairman of its science advisory committee from 1942-1949.

DR. G. I. HIGSON, technical director, Billingham Division, Imperial Chemical Industries, Ltd., will represent the chemical industry on the Industrial Mission to Pakistan which is due to arrive in Karachi on February 26. The doctor served on the International Commission on synthetic nitrogen held in Egypt in 1948.

SIR BEN LOCKSPEISER, secretary of the Department of Scientific and Industrial Research, is to perform the official opening of the Research and Production Exhibition of the British Welding Research Association, on February 6, at its London headquarters, 29 Park Crescent, W.1 (THE CHEMICAL AGE, 62, 22).

MR. G. A. S. NAIRN, chairman of Lever Brothers, Port Sunlight, Ltd., on January 21 was installed president of the Birkenhead and Wirral branch of the United Kingdom Commercial Travellers' Association, of which the first Lord Leverhulme was the first president.

MR. T. C. FAWCETT, re-elected as chairman of the Chemical and Allied Trades Section of the Manchester Chamber of Commerce, is northern regional manager of I.C.I., Ltd. Our reference to the Chemical and Allied Trades Section (62, 117) wrongly associated him with the General Chemicals Division of I.C.I.

MR. FRANCIS D. MORRELL and MR. ARTHUR HARTOG, directors of Lever Bros. and Unilever, Ltd., have arrived in New York to assume responsibility for the interests of the company there.

DR. F. J. PATON, director of research of the Dunlop plantations in Malaya, has left by air to take up his duties in the new rubber research centre which Dunlop is about to open in Negri Sembilan, and which will work in close co-operation with the Rubber Research Institute in Malaya. Dr. Paton, formerly associated with the School of Fermentation Chemistry at Birmingham University, went out to Malaya for Dunlop 16 years ago to investigate problems relating to the production of latex. His assistant director, MR. D. W. POUNDER, went out to Negri Sembilan in the Autumn, and there is to be a rotation of staff between Malaya and the research centre at Fort Dunlop.

MR. JAMES MACLEOD, retired Glasgow chemical engineer, left estate valued at £15,034.

The New Patents Judge

AT the beginning of the New Year Mr. Justice Lloyd Jacob started his work as the Patents Judge. He had been appointed in accordance with the Patents and Designs Act of 1949, which provided for the first time that a special puisne judge should be appointed to deal with patents designs matters. At the moment he does not appear to be very busy, as part of his time has been spent sitting as an additional judge of the King's Bench Division.

The new judge is 52. He was called to the Bar by the Middle Temple in 1923 and began a distinguished career in the next year by becoming King Edward VII Scholar of his Inn. His success at the patents bar was recognised by his appointment in 1937 as junior counsel to the Board of Trade in Patent matters. He held this appointment until he became a King's Counsel in 1945.

Mr. Justice Lloyd Jacob is not well known outside the profession because patent cases rarely attract notice from the daily papers. He lives in Dorking, and is a lay reader of the Diocese of Guildford.

Obituary

The death has occurred of MR. A. GLYNNE LOBLEY, managing director of Birlec, Ltd., makers of heat-treatment and melting furnaces, Tyburn Road, Erdington, Birmingham, 24.

Next Week's Events

MONDAY, JANUARY 30

The Chemical Society

Leeds: University, 6.30 p.m. Dr. F. L. Rose: "The Basis of Chemotherapeutic Research."

Incorporated Plant Engineers

Leeds: University, 7.30 p.m. (West and East Yorkshire Branch). W. F. Gerrard. "Steam Plant Scale."

TUESDAY, JANUARY 31

Hull Chemical and Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. W. N. Espie: "The Manufacure and Testing of Portland Cement."

Society of Instrument Technology

London: Manson House, Portland Place, W.1, 6.30 p.m. J. C. Evans, M. Groneek and H. G. Loe: "Continuous Gauging of Materials in Thread or Wire."

Parliamentary and Scientific Committee

London: Savoy Hotel, Strand, W.C.2. Annual meeting, 11.30 a.m.; luncheon 1 p.m.

WEDNESDAY, FEBRUARY 1

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7 p.m. I. C. Fitch: "Arc Welding Electrodes, their Uses and Abuses."

Institution of Works Managers

London: Royal Society of Arts, John Street, Adelphi, W.C., 6.45 p.m. (With Institute of Industrial Supervisors). "The Relationship Between the Foreman and the Works Manager."

Society of Public Analysts and Other Analytical Chemists

London: Burlington House, Piccadilly, W.1, 7 p.m. (Physical Methods Group). "Modern Methods of Moisture Determination." Papers and discussion.

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. (With Iron and Steel Institute). Mrs. C. F. Tipper: "Brittle Fracture in Mild Steel."

THURSDAY, FEBRUARY 2

The Chemical Society

London Burlington House, Piccadilly, W.1, 7.15 p.m. H. M. Powell: "The Structure of Molecular Compounds"; G. Stein and J. Weiss: "Chemical Actions of Ionising Radiations on Aqueous Solutions."

North Wales: Bangor, University College, 5.30 p.m. Prof. F. E. King: "Some Aspects of the Chemistry of Simple Peptides."

Sheffield: University, 5.30 p.m. Prof. H. W. Melville: "The Breakdown of High Polymer Substances."

Incorporated Plant Engineers

Peterborough: Eastern Gas Board, Church Street, 7.30 p.m. T. W. Palk: "Thermostatic Control."

Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. A. R. Powell: "Recent Progress in the Production of Some of the Rarer Metals."

Leeds Metallurgical Society

Leeds: University, 7 p.m. Prof. A. Preece: "Oxidation and Scaling of Steels."

Institute of Packaging

London: Waldorf Hotel, Aldwych, W.C.2, 6 p.m. "Packaging and the Exporter."

FRIDAY, FEBRUARY 3

Society of Chemical Industry

Brighton: Technical College, 7 p.m. (Joint meeting with RIC). Dr. J. L. Edgar: "Modern Methods of Organic Solvent Manufacture."

Glasgow: (Plastics and Polymers Group with Glasgow Section). Dr. W. C. Fergusson (I.C.I., Ltd., Plastics Division): "Polytetrafluorethylene."

Institution of Chemical Engineers

Manchester: College of Technology, 3 p.m. (North-West Branch). Annual general meeting. Sir Wallace Akers: "Atomic Energy."

Society of Chemical Industry

Manchester: Gas showrooms, Town Hall Extension, 6 p.m. Major F. A. Freeth: "The Art of Scientific Discovery."

SATURDAY, FEBRUARY 4

British Interplanetary Society

London: Caxton Hall, Westminster, S.W.1, 6 p.m. Discussion: "The Effects of Interplanetary Flight."

Textile Institute

Macclesfield: King's School, 10 a.m.-5 p.m. One-day conference and discussion: "The Preparation of Continuous Filament Yarns for Weaving and Knitting." Opening by the president of the institute, J. Foster Beaver.

◆ HOME ◆

Zinc Prices Cut

A reduction of zinc metal prices by £2 per ton (to £85 10s.) was announced this week. The various grades of zinc oxides are also subject to a price reduction of £1 15s. per ton.

Long Service Record

Over 280 employees and pensioners with a combined service of more than 8000 years recently attended a dinner given in their honour by Evered & Co., Ltd., Smethwick. Badges and awards were presented by the chairman to all those who had completed 50, 25, and 15 years with the firm.

Coal Output Down

The recovery in production of deep-mined coal in Britain which followed the Christmas and New Year holidays was checked last week. Comparative figures are:—Last week: Total 4,421,900 tons (deep-mined 4,170,900 tons, opencast 251,000 tons); previous week: Total 4,474,100 tons (deep-mined 4,231,400 tons, opencast 242,700 tons).

Big Steelworks Fire

One of the biggest blazes in the district since the "blitz" days has occurred at the Lancashire Steel Corporation's works at Irlam, near Manchester. The fire involved a 300 ft. long conveyor, carrying coal to the head of a 150ft. tower, whence it is fed into the chemical extraction plant. Firemen set up a wall of water at the foot of the tower, but two hours elapsed before the blaze was under control.

Rapeseed and Rapeseed Oil

Limited imports of rapeseed and rapeseed oil from Argentina under individual licence were permitted as from Monday (January 23). Applications for import licences are being dealt with by the Oils and Fats Division, Ministry of Food, London Road, Stanmore, Middlesex.

Minister of Supply at Stockton Works

The Minister of Supply, Mr. G. R. Strauss, recently visited the Stockton works of the Power-Gas Corporation, Ltd., and Ashmore, Benson, Pease & Co., Ltd. During his tour the Minister saw a model of the proposed new works representing the companies' planned extensions on a 100-acre site.

Twenty-one Affected by Chlorine Gas

A motor tanker containing a bleach fluid on January 16 accidentally discharged its contents into a tank containing hydrochloric acid at the Roe Acre Dyeing and Felting Co.'s mill at Heywood (Lancashire). Twenty-one people who were detained in hospital suffering from effects of the chlorine gas evolved were next day stated to be "very comfortable." Workmen on night duty at the mill and people living in streets adjoining the mill were affected by the gas. Police and firemen wearing gas masks searched the mill to see that all the workers were out, and police cars used loudspeakers to warn residents of the danger, and to stress the need for a flow of air through their houses to dispel the gas.

Evidence of the widening research activity by Monsanto Chemicals, Ltd., is the company's acquisition of Fulmer Hall, Buckinghamshire, which, after conversion and the installation of equipment, will be used as an additional research centre. Only eight months have elapsed since the company's new central research unit was opened at Ruabon (THE CHEMICAL AGE, *60*, 781-2)

[Photograph, Monsanto Chemicals, Ltd.

◆ OVERSEAS ◆

Egyptian Phosphates for Japan

Egypt is to supply 50,000 tons of phosphates, valued at £E125,000, to Japan. A further 200,000 tons are to be shipped later.

German Industries Fair

Organised for the first time since the war by a committee composed entirely of Germans, the 1950 German Industries Fair will be held at Hanover in two parts, the first from March 29 to April 2 being devoted to light industries, and the second from May 3-14 to heavy industries.

Horlicks Plant for Australia

Horlicks, Ltd., the milk processers, are planning to establish at a cost of about £A250,000 a second plant in one of Australia's richest milk producing areas, at Nowra, N.S.W. The company already operates a plant in the southern part of the State.

Synthetic Fibres in Western Germany

Output of rayon and staple fibre in the Federal German Republic was doubled last year according to the report of the Association of Rayon and Staple Fibre Manufacturers. The first production of Perlon in Western Germany was begun towards the end of last year.

Pure Liquid Helium

A single drop of pure condensed helium gas, reputedly the only one of its kind in the world, has been isolated by scientists at the Argonne National Laboratory, Chicago, Illinois. This light helium, or HE$_3$, was isolated by Darrel W. Osborne, Bernard Weinstock and Bernard M. Abraham, who condensed the gas at a temperature slightly above absolute zero to −453.93° F.

Substitute for Lithopone?

The Kaolin Works Wiesa, near Kamenz, in the Soviet Russian zone of Germany, is reported to be marketing a new filling material. called Belit, which is claimed to be a perfect substitute for lithopone, etc. The new product is a colloidal kaolin won from local deposits according to a special process. It is to be used in the first instance by the rubber manufacturing, cosmetics and pharmaceutical industries. Filling materials have so far been scarce in Eastern Germany and have had to be imported. However, it is hoped that the Wiesa Works will soon be in a position to cover the zone's whole needs in this respect.

Another German Blast Furnace

The Huckingen Metallurgical Works, Duisburg a/R., announces the starting this month of its third blast furnace. Monthly crude steel capacity of this works is about 65,000 metric tons.

Albania's First Match Factory

Albania's first match factory started operations in Tirana at the beginning of this year. Daily output is reported to total 20,000 boxes. The required chemical raw materials are being supplied by the Soviet Union.

Swiss-Brazilian Fertiliser Plant

Reports from Brazil state that a company is to be formed, with the participation of Swiss capital, for the production of nitrogenous fertilisers in the State of Bahia. According to present plans, an annual production of about 45,000 metric tons may result.

Italian Sulphur for Australia

An agreement for the shipment of 150,000 metric tons of Sicilian sulphur, valued at about 4 milliard lira, is reported to have been made by Italy with Australia and New Zealand. Italy agreed to accept payment in sterling, to be used for the purchase of raw materials from Commonwealth countries.

Swiss Chemical Exports

Swiss exports of chemical and pharmaceutical goods rose sharply in December, amounting to (million Swiss francs): 54.0, as compared with 40.3 in November. Particularly noteworthy is the marked increase in value of shipments of aniline dyes and indigo from 16.0 to 25.3. Exports of pharmaceutical products increased by 3.3 to 19.3, industrial chemicals from 6.3 to 6.8, and cosmetics from 2.0 to 2.6.

Russian Chemicals in 1950

Impetus given by German chemists is expected to produce greatly increased production in chemical industries in the U.S.S.R. Estimated production figures for 1950 include: caustic soda 890,000 tons; carbonate of soda 800,000 tons; mineral fertilisers 5.1 million tons; other synthetic fertilisers 48,000 tons. Raw materials allocated for the industry are scheduled to be increased to provide 250 million tons of coal. 35.4 million tons of crude oil and 1.9 milliard cubic metres of gas. Preparation of numerous chemical products for plastics, colours. varnish, medicinals, etc., is being intensified.

BRITISH PETROLEUM PLANT

Alleged Shortcomings of Suppliers

OUTSPOKEN criticism of shortcomings to which it was alleged some U.K. suppliers of oil refining and similar equipment are prone was made in Glasgow last week by Mr. C. H. Rebbeck, an official of the Anglo-Iranian Oil Co., Ltd. Mr. Rebbeck, speaking to the Scottish section of the Council of British Manufacturers of Petroleum Equipment, criticised in particular the high costs of such plant and alleged that extremely long delays in fulfilling orders were common.

Constructional costs all over the world were much too high, said Mr. Rebbeck, and when they went up a vicious spiral was started and fewer orders for plant and equipment were placed by manufacturers. The costs as they applied to oil sites were raised by a number of factors, the most important of which were the failure by manufacturers to adhere to promised delivery dates and frequently the unsatisfactory quality of the material supplied.

Slow Deliveries

Of orders placed by his company 96 per cent were not delivered by the specified date. That meant that the costs on the job were greatly increased. There were many difficulties preventing firms completing an order on time, but it was of vital importance that they should let the buyers know the situation, so that adjustments in the employment of labour could be effected.

It was no longer true that Britain produced the best quality materials. Even if materials were delivered on time, delays were often experienced and costs again raised when the constructional engineers had to effect adjustments and reject certain materials which were not up to standard. A great deal of the materials which came from the manufacturers was of no use for the job in hand.

" Give us good delivery of the proper quality of materials properly packed," Mr. Rebbeck said, " and you are going to bring down costs. If you do this, you are not only helping yourselves, but you are helping the rest of industry as well."

Mr. R. A. Browne, who gave the council a description of organisation within the Anglo-Iranian Oil Company, recommended that U.K. manufacturers should attach more importance to the production of spare parts for general machinery. Britain lagged very far behind America in that respect.

CHEMICALS FROM U.S.A.

No Drastic U.K. Cuts Foreseen

CERTAIN factors assume considerable importance in determining the possible course of (U.S.) chemical trade. Outstanding are the return of pre-war suppliers to full competition, the ever-growing use of bilateral agreements, and the complex currency situation. The latter is a dominant factor.

The greater shortage of dollars, the devaluation of the pound, which countries will have the currencies with which to pay for goods—all bear on the chemical trade.

The devaluation of the pound has not had any immmediate effect upon trade between the U.S. and the U.K., nor has it so far greatly affected the domestic market. A decrease in the high postwar exports of the U.K. is anticipated, but ECA assistance and the expansion of the British chemical industry also are factors along with devaluation.

Efforts to increase British exports to dollar countries will be intensified and all advantages resulting from the financial measure will be utilised. However, it must be remembered that to bridge the pre- and post-devaluation gap British exporters must earn at least as many dollars as the difference in the value of the currency.

In the case of third markets, the United Kingdom enjoys a distinct advantage. It can operate in a price zone between a $2.80 and a $4.03 pound; where feasible, it will maintain its former prices and enjoy a significantly greater return.

(Mr. C. C. Concannon, chief of the Chemical Branch of the Office of International Trade, U.S. Department of Commerce in " Chemical and Engineering News.")

Petroleum Congress

THE Institute of Petroleum has been invited to form a national committee to represent Great Britain at the third World Petroleum Congress to be held at The Hague, Holland, from May 28 to June 6 next year.

The British delegates will be: E. A. Evans, Lieut.-Colonel S. J. M. Auld, C. Chilvers, T. Dewhurst, Prof. F. H. Garner, H. S. Gibson, H. Hyams, G. Sell, C. A. P. Southwell and H. C. Tett.

Papers will be presented under the following headings: geology and geophysics; drilling and production; refining technology; petrochemicals; analysis and testing; utilisation of products; plant and equipment; transport, storage and distribution; economics and statistics.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Tanks & Linings, Ltd. (formerly Tank Linings, Ltd., & Thompson-Jaray, Ltd.), Droitwich. (M., 28/1/50.) December 21, £10,000 (not ex.) mortgage to Lloyds Bank, Ltd.; charged on land, factory and buildings at Town Wharf, Droitwich. *Fluctuating around £10,000 (bankers). April 19, 1949.

Woodall-Duckham Vertical Retort & Oven Construction Co. (1920), Ltd., London, S.W. (M., 28/1/50.) December 20, charge and deed of variation by way of substituted security for securing to Alliance Assurance Co., Ltd., £180,000 owing under a charge dated June 4, 1947, and a further advance of £120,000; charged on 63/77 Brompton Road, S.W.3. *£180,000. June 10, 1949.

Satisfactions

Harefield Lime Co., Ltd., Cowley (Middx.). (M.S., 28/1/50.) Satisfactions December 29, of mortgage registered October 9, 1936, of debenture registered February 15, 1940, and of charge registered June 6, 1941.

Petrochemicals, Ltd., London, W. (M.S., 28/1/50.) Satisfactions December 29, of two trust deeds registered August 20, 1947.

Increase of Capital

The following increases in registered capital have been announced: Charles Karene & Co., Ltd., from £5000 to £20,000. Witco Chemical Co., Ltd., from £25,000 to £30,000.

New Registrations

Private company. (477,383.) Capital £1000. Manure and fertiliser manufacturers, grease refiners, manufacturers of soap and washing materials, etc. Directors: E. T. Banks, H. J. Holford, A. F. Dolman. Reg. office: 57 Bridge Street, Newport, Mon.

Company News

Benn Brothers, Ltd.

The directors of Benn Brothers, Ltd., publishers of The Chemical Age, have declared the following dividends, less tax, payable on February 15: 3 per cent on the preference shares for the half-year ended December 31, 1949, and interim dividend of 5 per cent on the ordinary shares (same).

British Chemicals & Biologicals, Ltd.

Net profit for the year to June 30, 1949, was £16,069 (£3723). As last year, no dividend has been recommended on the ordinary stock.

Fisons, Ltd.

A final dividend of 9½ per cent making 12 per cent, less tax (same) for the year ended June 30 on the old ordinary stock and a dividend of 2½ per cent, less tax, on the £2,219,278 new ordinary stock, issued in October, are recommended. Net profit of the group was £222,639 (£223,167).

Power-Gas Corporation, Ltd.

Group profit on trading was £337,918 for 1949 (£267,221). Payment of a dividend of 12½ per cent, subject to income tax, was recommended.

The creation of a new works on a fresh site was the aim of a programme of long-term construction, and negotiations for a site near the present works were being completed.

Redfern's Rubber Works, Ltd.

Dividends of 3¾ per cent on the A and B preference shares, making 7½ per cent for the year, and of 5 per cent on the ordinary shares, making 10 per cent (plus a bonus of 5 per cent) were recommended, to be paid on March 15.

Stewarts & Lloyds, Ltd.

From the beginning of this year, all the mineral properties of Stewarts & Lloyds, Ltd., the Stanton Ironworks Co., Ltd., and other subsidiary companies, and land associated therewith, were transferred to Stewarts & Lloyds Minerals, Ltd., by which company they will in future be owned and operated. The directors are: Mr. J. R. Menzies-Wilson (chairman), Mr. R. B. Beilby and Mr. A. F. Holden, and the secretary Mr. J. McLaren. The administrative office of the company is at Brigstock, near Kettering, Northants.

Chemical and Allied Stocks and Shares

MARKETS have remained cautious and inactive under the influence of the imminent General Election, although the undertone has been described as firmer since Mr. Churchill's broadcast and the improvement in British Funds in evidence since the end of last week. British Funds recorded sharp gains ranging up to £1 in long dated stocks, moderate buying having a disproportionate influence because of the very small amount of selling.

Industrial assurance shares were marked back sharply on the mutualisation proposals, although selling was very moderate. In the nationalisation context, cement shares also fell back sharply, but chemicals, after earlier small declines, tended to recover.

Imperial Chemical, after falling to 40s. 6d. at one time last week, have since rallied to 41s.; Fisons at 26s. have strengthened on the financial results. Albright & Wilson were 29s., Amber Chemical 2s. shares 5s., Bowman Chemical 5s. 6d., and Brotherton 10s. shares 19s. 3d. Monsanto Chemical were 50s. 9d., F. W. Berk 2s. 6d. shares 14s. 3d., Pest Control 8s. 3d., and Boake Roberts 25s. 6d. W. J. Bush were 61s. 3d., Laporte Chemicals 5s. ordinary 9s. 4½d., and Lawes Chemical 9s. 6d.

Boots Drug fell back further to 47s. following reports of the big new issue, and Borax Consolidated weakened to 55s. 3d. British Glues 4s. shares have been firm at 19s. 6d., British Match steady at 34s., and Dunlop at 60s. 9d. regained part of an earlier decline. Levers, however, have eased to 41s. 6d., and Lever N.V. to 43s. 6d. At 39s. 3d. British Aluminium lost some ground, but General Refractories showed firmness at 23s. 1½d. Metal Box were 87s. 6d., United Glass Bottle were firm at 68s. 9d., and Turner & Newall were good at 76s. 6d. United Molasses eased further to 38s. 6d., and De La Rue to 22s. 9d. British Xylonite were 57s. 6d., and British Industrial Plastics 2s. shares 4s. 6d. International Combustion 5s. shares have been steady at 16s. 4½d., and Babcock & Wilcox 59s.

Movements in iron and steels were again small, investors failing to be attracted by the good yields because of the threat of nationalisation. With few exceptions current prices still remain well below the scheduled take-over levels fixed in the event of nationalisation. United Steel were 26s. 3d., Dorman Long 31s., Hadfields 26s. 9d., Colvilles 34s. 6d., and Richard Thomas & Baldwins 13s. 9d. Guest Keen were 40s. 3d., Staveley 78s. 3d., and T. W. Ward were firm at 56s. Amalgamated Metal firmed up to 17s. 9d., but Triplex Glass at 18s. failed to hold an earlier small rally.

Among cements, the nationalisation threat put Associated back to 72s. 6d., British Portland to 71s. 3d., Tunnel to 42s. 9d., and Rugby Cement to 15s. British Plaster Board have been steady at 12s. 9d., and Pinchin Johnson rallied to 36s. 6d. Oil shares, after earlier declines, turned firmer on hopes that an agreement may be made to modify Britain's decision to reduce oil imports from the dollar countries. If the latter is carried out it may lead to lower oil prices in the U.S.A. and this in turn would affect world oil prices and mean lower profits for the producers. Shell have rallied to 63s. 1½d., Anglo-Iranian to 6 7/16, and Trinidad Leaseholds to 22s.

More Import Relaxations

THE removal of import licensing restrictions from a further wide range of goods, in accordance with the Government's previous agreement with the OEEC (THE CHEMICAL AGE, *61*, 868) became effective on January 25.

Further chemical items, drugs, medicines, etc., now freed from import restrictions include:—

Acid sodium pyrophosphate; carmine; compounds (not including ores or minerals) of thorium, cerium and the other rare earth metals; compounds (not including ores or minerals) of molybdenum and vanadium; lanoline; magnesium glycero phosphate.

The new facilities apply to those countries (excluding the U.S.A., S. American countries, U.S.S.R., etc.) to which previous aid has been extended.

U.K. Light Metal Statistics

Ministry of Supply statistics relating to U.K. production, imports and consumption of light metals in November include the following (in long tons):—Virgin aluminium: production 2332, imports 9047. Secondary aluminium: production 6835. Aluminium scrap arisings: total 9823, consumption 9500. Aluminium fabrication: 17,922. Magnesium fabrication 295.

Prices of British Chemical Products

Sounder Basis of Trading in Most Centres

FEW changes have been noted in the industrial chemicals market during the past week and conditions are reported to be steady. There is an increase in consignment, both for foreign and home deliveries, and makers are quoting firm delivery dates. Coal tar products are, without exception, steady. Pitch is moving well, both on home and export account, and there is a strong demand for xylol.

MANCHESTER.—Firm price conditions have continued in virtually all sections of the Manchester chemical market. The textile and allied industries and other principal home trade consumers are taking good deliveries of caustic soda and other alkalis, and a wide range of other heavy chemicals is being absorbed in substantial quantities. New bookings on both home and export account have been on a fair scale during the past week. Among the fertiliser materials superphosphates and sulphate of ammonia are in gradually improving demand. Mixed trading conditions are reported in the tar products market, with the light distillates being called for in reasonably good quantities.

GLASGOW.—Business in general in the Scottish chemical market has improved slightly, principally as a result of the opening up of the textile trade after the New Year holidays. The export market continues to show an improvement.

Price Changes

Rises: Barium carbonate, barium sulphate, liquid chlorine, copper carbonate, copper chloride, copper nitrate, paraffin wax, sodium percarbonate, sodium sulphide, zinc oxide.

Reductions: Borax, boric acid.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder. £68 10s.; B.P., granular, £75 10s.: crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 7d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107 per ton. (Nominal.)

Lead Carbonate.—British dry, ton lots, d/d. £115 10s. (Nominal.)

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £110.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £119 10s., orange lead, £131 10s. Ground in oil: red, £140 10s., orange, £152 10s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £127 15s. per ton, Ground in oil, English, under two tons, £146 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£119 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal,

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £61 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £20 14s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 16s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid. 60/62%, spot. £24 10s. per ton, d/d, in drums; broken, £25 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £86 10s.; green seal, £85 10s.; red seal, £84.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in January £10 6s. 6d., rising by 1s. 6d. per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £16 1s., rising by 2s. 6d. per ton per month to June, 1950. National No. 2, £10 18s. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots. d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d per gal.; 99%, 3s. 1d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/140°, 22s. to 23s. per gal.; 90/160°, 21s. MANCHESTER: 19s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: January 23. The price of all refined oils and fats remains unchanged during the eight-week period ending February 25. The price of palm oil is now £99 per ton and Australasian inedible tallow ranges from £80-£102 10s. per ton according to grade. The prices of all other unrefined oils and fats remain unchanged during the five-week period ending February 4.

Chemical Supplies and Services

Dyestuffs Intermediates Jubilee

THE aniline dye and intermediate products manufacturing firm of John W. Leitch & Co., Ltd., Milnsbridge Chemical Works, Huddersfield, is this year celebrating its diamond jubilee. It was established by the late John W. Leitch in 1890 for the manufacture of coal tar derivatives forming bases for the preparation of aniline dyes and explosives and, in 1902, was one of the first makers of trinitrotoluol (TNT) in this country.

Following its experience in nitration processes, a natural expansion of the interests of this firm was in amines, diamines, nitro amino and amino azo compounds of all types, for use as dyestuffs intermediates and fast bases in the application of the insoluble azo colours to textile fibres. A method was introduced and patented for the application of azoic colours to wool. The firm was among the first manufacturers in this country of the equivalent of Hansa Yellows which formerly only Germany made.

Celebrating a Chlorine Record

A RECORD output of chlorine and chlorine products by the Cassel Works (B.C. Section), I.C.I., Billingham, was celebrated by a social attended by 90 employees in the Synthonia Club, Billingham. Congratulating the workers on their achievement, Mr. K. S. Jackson, deputy works manager, stressed the importance of chlorine production to the paper and steel trades and as a bleach.

Marine Paint Service

TO provide the shipping industry with a more efficient and economical paint service, the marine interests of three associated companies have been rationalised into one marine division under British Paints, Ltd., Royal Mail House, Leadenhall Street, London, E.C.3. The group incorporates the marine interests of the British Anti-Fouling Composition and Paint Co., Ltd., and J. & W. Wilson, Ltd. No change of directors or staff is contemplated.

This new marine division, which started operations on January 1, will be entirely responsible for the supply of marine paints in all home and overseas markets.

Improving Drying Oils

IMPORTANT improvements in the drying characteristics of natural drying oils, such as linseed and soya bean, are said to be conferred by a new American synthetic chemical, described as an " oil up-grader." The principle of this material, Dryene, is the introduction of conjugated unsaturation into the oil molecule. The resultant fast-drying oil, which develops carbon to carbon linkages, can be combined with phenolic resins to yield varnishes with high resistance to moisture and alkali. The use of the additive in an alkyd formulation is said to confer these and several other advantages, including greater toughness and durability. The time-saving factor is, however, one of the outstanding merits claimed by the U.S. Carbide and Carbon Chemicals Corporation, which is now producing the synthetic on pilot plant scale. The interest in the new material here is represented by General Metallurgical and Chemical, Ltd.

Chemical Engineers' Expansion

THE chemical engineering firm of Nordac, Ltd., whose works are at present located at Dukes Road, Western Avenue, London, W.3, is in process of moving into larger premises at Cowley Mill Road, Uxbridge, Middlesex. The move will be completed on February 1. The new works cover some three-and-a-half acres, providing increased accommodation for the construction of acid-resisting rubber-lined chemical vessels, in which the firm specialises, and for larger scale of research carried out for the industry.

In addition to the lining of plant and vessels " on the site," much work has been done by this firm on the development of chemical processes, including the treatment of spent pickle from steel works, fume removal from acid factories and special plant of all kinds. It is now developing a submerged flame burner for the concentration of acids and evaporation of all kinds of corrosive solutions.

Thioglycolic Acid for Austria

The Linz Nitrogen Works has recently taken up the manufacture of thioglycolic acid used in particular in the manufacture of certain dyestuffs. Output is reported to cover domestic needs.

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BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4
Telegrams: ALLANGAS FLEET LONDON · *Telephone:* CENTRAL 3212 (20 lines)

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Facts about Chemical Industry

IT was in September, 1948, that the President of the Board of Trade called upon the chemical industry to give an account of itself. Not long before Mr. Harold Wilson had announced that the industry was to be spared "the ordeal by Working Party." The awareness which he showed then of the extreme complexity of chemical industry has now been justified, and presumably made very much more acute, by the publication this week by the Association of British Chemical Manufacturers of the survey of chemicals and chemical undertakings, which has required over a year's work and the help freely given by five other trade associations and industrial firms. No one giving even cursory attention to the Report on Chemical Industry, 1949, will ask why it should have required more than a year to collate. It is a monumental work, regardless of its having been compressed into 75 pp.; and because it is the only authoritative attempt to define what chemical industry is, and what are its intentions and prospects related to past performance, it must form the standard reference in this context for many years to come. The ABCM and its collaborators are deserving of some congratulation on having made manifest that what most of us term " the chemical industry," which some have regarded as a suitable subject for State enterprise, so far from being an entity is one of the most complicated agglomerations of highly specialised activities in the United Kingdom, and intertwined with them are the interests of nearly every other form of national production.

The ability of the ABCM to produce this account at relatively short notice is partly explained by the wise decision that chemical industry must in this case be defined as those undertakings responsible for the production—as opposed to processing or conversion to other uses—of 17 groups of essential chemicals. The chosen classification was this: Sulphuric acid, alkalis (including chlorine); other inorganic acids and salts (including carbide); industrial gases; nitrogen fertilisers; soluble phosphate fertilisers; other chemical fertilisers; heavy organic chemicals; chemicals for pharmaceutical and veterinary products; miscellaneous fine chemicals; dyestuffs and intermediates; pigments; explosives (industrial only); chemicals for pest control and for agricultural and horticultural purposes not elsewhere included; plastic materials and synthetic resins; miscellaneous chemi-

On Other Pages

Leader:
Facts About Chemical Industry 177
Notes and Comments:
Science at the Festival . . 179
Tracers for Industry . . 179
Objections to Agene . . 179
Microchemistry Congress . . 180
Safety in Solvents Works . . 180
Atomic Energy Talks . . 181
High Capacity Diffusion Pumps . . 181
British Experts for U.S.A. . . 181
Production Records . . 182
Eastern Industrial Development . . 182
The Structure of Matter . . 182
The Report on Chemical Industry 183
Chemical "Improvement" of Food 189
Beryllium Hazards . . 190
Drugs and Fine Chemicals in 1949 191
METALLURGICAL SECTION
Steel Achievement and Outlook . . 193
Development of Powder Metallurgy 195
Light and Measurement . . 198
Technology of Aluminium and Alloys 199
New Uses for PTFE . . 202
Swiss Chemical Exports . . 202
Canada's Chemicals . . 202
Fischer-Tropsch Principles in U.S.A. 202
Targets for Fuel and Power Research 204
Shale Oil Centenary . . 210
Fostering India's Plastics Industry 212

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cals not covered by the above groups; coal tar distillation products.

To reduce the candidates for inclusion among chemical producers even to a list of these proportions must have called for severe restraint on the part of the compilers, but even in this simplified category the ABCM found it impossible to identify undertakings with the complete production of one particular chemical material or to distinguish all the main producers. The report does not disguise the fact, which would appear to have been inevitable, that the evidence of a number of firms having a diversity of interests had to be omitted from the sectional summaries. There can be no doubt, however, that if the Report on the Chemical Industry has to be regarded as a fair sample rather than the alpha and omega of the subject, it still gives an extremely intimate yet unbiased picture of the sources of the main chemical supports of industries in general, how they came into being, their enterprise and productivity in the past and their proposals and requirements for further development. Any impartial judgment founded on the facts thus presented must acknowledge several things of peculiar interest at the moment.

There can in the first place be no doubt that the main body of chemical production in this country is at least as well able as any counterpart in industries as a whole to provide for all essential needs and leave an export margin, so long as a few vital raw materials are not diverted from it. Secondly, no development council or other Government - sponsored agency could have brought about a greater rate of expansion, both of production and of objectives, than has now been shown to have taken place in 25 years or less in capacity to produce such things as explosives, dyestuffs, plastics and chemical fibres, medicinal chemicals, agricultural and veterinary materials and high pressure products (i.e., the synthetic form of ammonia and methyl alcohol and coal-derived petrol). This, however, is only one of a host of proofs given here that the making of chemicals in the United Kingdom has attained a degree of ingenuity and competence which no outside intervention could enhance. The section considered here has the use of all the capital it needs—£231 million in plant and money, equivalent to some £400 million at present values—and it employs its great resources with a courage and liberality towards advancement by research and innovation which almost certainly have no parallel. If a large part is in the hands of "a monopoly" there is no alternative that would yield essentials so efficiently and cheaply.

Notes and Comments

Science and the Festival

"DISCOVERY" will be the theme of many or most of the displays which will form the basis of the 1951 Exhibition, so that the sciences, and especially chemistry, will be the inspiration of most of them. That appeared to be the significant fact contained in the considerably amplified data proffered by the exhibition authorities last week, in which the emphasis on science or technology, not only in the Dome of Discovery and the South Bank Exhibition, but in the Science Museum, Kensington, the Kelvin Hall, Glasgow, and the road and sea-borne exhibitions, evidenced the intimate co-operation which will be required from large numbers of specialists. The other salient fact was the success the project has already had in securing the participation, as members of the Council of Science and Technology or of specialists' panels, of the principal figures in each of the fields concerned. Because this is to be essentially a popular presentation, not a science congress, the need for highly expert direction is indispensable. Thousands will draw lifelong impressions of the aims and methods of science from these aspects of the Festival of Britain, and it is well that the interpretation will come from the only authoritative sources. It would be hard to find a better occasion to explain the British rôle in the peaceful uses of atomic power and nuclear physics. The omission of any reference to the AERE programme for the exhibition is hard to explain.

Tracers for Industry

THERE are numerous manufacturing processes and methods of their control, both in the chemical and some other industries, to which radioactive tracer element technique is already being applied, and its further uses in production and research are thought by people well qualified to judge to be almost limitless. An arresting bid to gauge the extent of industrial interest in this very promising technique, if expert guidance were available in the factories, is being adopted by one British firm (Mactaggart & Evans, Ltd.). This is in the form of a questionnaire which is being sent to some 10,000 manufacturing firms of all kinds in Britain, Norway, Denmark, Sweden, and Holland, asking if they think radioactive tracer technique could help their individual research or production and whether they contemplate establishing their own laboratories. The inquiry is also intended to gauge the present requirement of special compounds containing tracer elements. The replies must, of course, be treated as confidential, but it is proposed to publish the overall results of the survey, which may have the effect of persuading the authorities to make available sooner a sufficiently wide range of radioactive materials. The desirability of that seems to have been better recognised in the U.S.A. as a means of reducing still further the time occupied in many productive and scientific processes. The same firm is now issuing a bulletin which deals comprehensively in generally intelligible terms with the use of radioactive tracer elements in industry and research.

Objections to Agene

IN arresting contrast with the "good Press" which seems to be accorded to the general subject of chemicals is the uncompromising attitude taken by the Medical Research Council, represented in particular by the broadcast and other activities of its secretary, Sir Ernest Mellanby, designed to discourage the somewhat indiscriminate use of chemical materials in foodstuffs. One direct result has been the recommendation by the Ministries of Food and Health that the use of nitrogen trichloride (Agene; NCl_3) as a bleach and improver of bread should stop. But, indicating how intimate has become the dependence upon chemical improvers, the Ministries are in favour of the use in flour of harmless chlorine dioxide, when home producers of a suitable form of this additive are equipped for the job. That will not be for some time. The Government departments seem to have been egged into rather reluctant action, for they are at some pains to minimise the possibility of harmful effects of the chemical methods of procuring a white loaf. After long study of the subject with the milling industry and the MRC, they say they can find no evidence that agenised flour is at all toxic to man, but in view of the deleterious effect on certain animals (dogs and ferrets in particular, according to the medical council) they considered the use of the chemical should be stopped. The fact that the Agene method has been in use in Britain, Canada and the U.S.A. for 75 years is noted, but not the decision in the U.S.A. last August to exclude nitrogen trichloride from bread (THE CHEMICAL AGE, *60*, 37). That, admittedly, does not prove the case for the prosecution.

Microchemistry Congress

A LIVELIER interest than is commonly displayed in relatively distant congresses is felt in chemistry circles here in the announcement that the Austrian Microchemical Society, under the presidency of Professor H. Lieb, is to hold the first International Microchemical Congress in Graz from July 2 to 6. There is sound warrant for this. In Graz the work of Emich and Pregl first laid the foundations of microchemistry, and from Graz the techniques spread till they have now become worldwide. In addition, the event appropriately commemorates the tenth anniversary of the death of Emich and the twentieth anniversary of the death of Pregl. Many well-known microchemists have already promised to attend and to present papers. The third pioneer in microchemistry, Professor F. Feigl, will come from Brazil. Other names of note are Belcher of Great Britain, Benedetti-Pichler of the U.S.A., Kahane of France, Wenger of Switzerland, Wilson of Northern Ireland, and Zimmermann of Germany. Other matters of interest in the provisional programme include the bestowal of honorary membership of the Austrian Microchemical Society, reports, exhibitions, receptions by the Styrian Government and by the Municipal Council of Graz. The secretarial duties are being carried out by Dr. H. Melissa, 1 Internationales Congress, Graz, Schlögelgasse 9, Austria.

Safety in Solvents Works

THE need for a high degree of safety-mindedness in plants producing solvents and similar highly volatile materials is sufficiently self-evident to make the task of the safety officer a little lighter than it might be elsewhere. The willingness to obey all the safety rules is, however, anything but automatic, so that the experiences of one large producer—albeit an American one—in minimising the accident rate are worth recording. The marked improvement in this respect achieved last year in U.S. solvents and distilled spirits plants can be attributed—according to Colonel Thomas F. Brown, of the National Distillers' Products Corporation—to the recognition by all ranks of the prime importance of observing the rules and the fact that a lead was given by the directors and chief managerial staff. To ensure that its plant safety arrangements were better than those statutorily required, National Distillers had encouraged friendly inter-plant, and inter-departmental rivalry in the matter of accident prevention work. This safety-consciousness was engendered by methods not new to the managements and workpeople of most chemical plants in the U.S.A. or in this country. Rather was it produced by a concentrated tightening-up of known preventive measures, and this, writes Colonel Brown in the *New York Journal of Commerce*, produced unexpected benefits for all concerned. In 1948 the disabling injuries per million man-hours worked totalled 11.49 for all American industry, whereas the distilling industry rate was 9.2. 1949 plant safety figures—not yet completed—were likely to provide just as favourable a picture.

ATOMIC ENERGY TALKS

More Data to be Disclosed?

REPRESENTATIVES of Canada, the United Kingdom, and the United States will meet at Britain's Atomic Energy Research Establishment, Harwell, Berks., on Thursday next (February 9-12) to discuss the further release of information on atomic energy work by the three countries. The meeting is the fourth in a series concerned with policy in the declassification of atomic energy documents. It will continue the work from the point at which it was left by the third conference, at Chalk River, Ontario, last September.

The new discussions will take acount of the announcement made on September 23 that an atomic explosion had occurred in the U.S.S.R. Recommendations resulting from the discussions will be reported to the Atomic Energy Agencies of the three Governments, for review before any final revisions in the existing uniform declassification guide are made.

The British delegates will be: Sir John D. Cockcroft (director, Atomic Energy Research Establishment); Prof. H. J. Emeléus (Cambridge University); Prof. D. Hanson (Birmingham University); Prof. R. E. Peierls (Birmingham University); and Mr. M. W. Perrin (deputy controller of atomic energy, Ministry of Supply).

Mr. J. H. Awbery and Mr. J. F. Jackson, of the Ministry's atomic energy division, will act as joint secretaries.

High Capacity Diffusion Pump

A NEW fractionating oil diffusion pump, said to be superior to previous pumps of the same size, has been developed by Distillation Products Industries, New York. This, the MCF-300, affords the extremely high speed of approximately 300 litres per second in the range 10^{-5} to 10^{-3} mm. Hg, the highest ever achieved with a 4-in. ID pump casing. An ultimate vacuum of 5×10^{-7} mm. Hg. at 25°C. is attainable. The new pump embodies a 3-stage concentric cylinder type of fractionating jet assembly fitted into an enlarged boiler, the latter providing vaporising surface sufficient to ensure adequate fractionation and jet power and enabling external electrical heating units to be used. The powerful jets are said to pump hydrogen one and one-half times faster than air and will operate against a forepressure of more than 0.150 mm. Hg.

BRITISH EXPERTS FOR U.S.A.

ECA Sponsors Two Research Projects

BETTER and more economic supplies of fuel both for industrial and domestic use it is hoped may result from the visits of two British scientists to the U.S.A., organised under the Economic Co-operation Administration's technical assistance programme.

Dr. E. T. Wilkins, principal scientific officer of the Fuel Research Station, has left to spend a year at Gorgas, Alabama, where the U.S. Bureau of Mines and the Alabama Power Company are carrying out large-scale experiments on the underground gasification of coal.

While some experiments of the same kind are being carried out in this country, it was felt that not only would Dr. Wilkins' participation in the American tests avoid duplication of scientific investigation, as recommended by the OEEC, but it was hoped that the doctor's knowledge and experience would also be of benefit to the U.S. scientists.

The other British expert is Mr. T. F. Hurley, also of the Fuel Research Station, who is due to reach the U.S.A. in April for a six-week study of gas turbine development.

As revealed by Dr. H. Roxbee Cox, chief scientist to the Ministry of Fuel and Power, at a Press conference last week, work of considerable promise was being done on various types of turbine, but it was felt that first-hand knowledge of American investigations would help in carrying out further research projects.

French Fertiliser Experiments

TESTS in the North of France using as an agricultural fertiliser direct anhydrous ammonia are reported to have given completely satisfactory results. Three tests were made on beetroot cultivation and, taking into consideration local conditions, output of areas treated with anhydrous ammonia was comparable to that of areas treated with sulphate of ammonia or nitrates. Conclusions show that anhydrous ammonia has a more rapid action and is more regular in its effect, while the relatively low cost is important. Its use is particularly interesting in connection with beet cultivation which needs a good deal of nitrogen, and less in the case of wheat, which is generally sown over the beetroot and benefits from the residue in the soil. Direct applications are also being tried on rape-seed but it is still too early to give results. Other tests concern rice cultivation.

PRODUCTION RECORDS

I.C.I. Petrol and Urea

RECORD outputs of products by I.C.I., Ltd., at Billingham, which will directly stimulate agriculture, rubber, oil, petrol, building, plastics, pharmaceuticals, textiles, and many other essential industries, are announced in a " production " issue of the group's Billingham news sheet, summarising 1949.

One record was achieved at the oil works where 47,000 tons of aviation spirit were produced for the Air Ministry following an appeal by the Ministry for as much octane fuel as possible for the use of aircraft engaged on the Berlin airlift. At the time, I.C.I. promised 40,000 tons, and hoped to reach 45,000. The highest production of pool petrol since 1941 was achieved with 87,000 tons.

Nearly 18,000 tons of urea were made at the new urea plant, which promises to be an important dollar earner; the U.S.A. requires 6000 tons, worth $750,000. A target of 400,000 tons for the sulphate plant was reached on the last day of 1949.

The Casebourne Works produced 270,907 tons of cement and Cassel Works, part of the General Chemical Division, increased production in a wide range of chemicals.

Eastern Industrial Development

INDUSTRIAL development in the Middle East and Far East comparable with the industrial revolution in this country a hundred years ago and affecting 1500 million people in the next half century was forecast by Mr. H. E. Alcock, managing director of Alcock (Peroxide), Ltd., in his presidential address to the Luton and District Chamber of Commerce last week. In those areas living conditions had made little or no advance in the last 2000 years, he said.

The U.S.A. and Western Europe were more or less parallel with Britain in industrial development and therefore in competition with us in supplying goods to the Middle East and Far East during their development, which might well take another 50 years. Fortunately there were indications that co-operation between the U.S.A., the Commonwealth and Western Europe was making some progress. This, however, did not mean that we could afford to relax for one moment in our efforts to produce more at a cheaper price by more efficient methods, to export more at a competitive price in order to pay for our essential imports, added Mr. Alcock.

THE STRUCTURE OF MATTER

Practical and Theoretical Advances

AN endeavour to establish the existence of a number of elementary particles which could be regarded as the basis of all matter made up, has always been one of the basic aims of physics. All natural phenomena should be explicable in the last analysis in terms of the properties of these particles, said Prof. J. C. Gunn, Cargill professor of natural philosophy, Glasgow University, in his recent address on " Fundamental Particles " to the Royal Philosophical Society of Glasgow.

Great progress had been made in the last 50 years in this research, which was now perhaps nearing its culminating point, the professor continued. Upon this the theoretical and the experimental research programme of the natural philosophy department of Glasgow University had been based.

Practical and theoretical advances had been inextricably mingled in the discovery of the five groups of particles at present known.

The second great new theoretical principle had been the special relativity of Einstein, which served to limit the possible wave equations that could be used to describe the elementary particles. It was a remarkable fact that some of the simplest mathematical schemes derived in that way actually described correctly most, if not all, of the properties of the known elementary particles.

The X-Ray Microscope

A NEW instrument, an X-ray microscope, is being developed by scientists of the (U.S.) General Electric Company. It does not require samples under study to be in a high vacuum, as does the electron microscope, and because of this, the company hopes it may be possible to examine living materials at much higher magnifications than before.

Clear, sharp X-ray images, magnified ten times, are claimed to have been produced and these have again been magnified ten times by photographic enlargement without serious loss of detail.

The microscope consists principally of an X-ray tube and a pair of curved mirrors (platinum coated quartz), which the X-rays strike after having passed through the sample. The mirrors, acting in the manner of a convex lens with a light beam, bend the rays so as to form a magnified X-ray image of the sample on a photographic film.

Report on Chemical Industry

ABCM's Revealing Study of Sources of Basic Supplies

THE completion of probably the most far reaching attempt to present in an assimilable form all the essential facts about the structure, present scope and future prospects of chemical producing industries in this country was signalised by the release this week of the Report on Chemical Industry, 1949.

This, collated and very lucidly presented by the Association of British Chemical Manufacturers, represents the association's response to the request made to it in September, 1948, by the President of the Board of Trade for a " survey of the whole of the chemical industry " and of the detail and general direction of future development. The President indicated that one of the objectives of such a survey would be to heighten the industry's own appreciation of the best means of securing the objectives described in the report.

These facts are now recalled in the preface to the completed report, which occupies 75 pages and a chart of the principal products of the British industry, and it is made clear why the association decided to provide something much fuller in its scope than what was asked for. Because of the interrelationships between various branches of chemical production and their direct links with other industries, no treatment of chemical industry as a complete entity is possible. It has, as the report observes at the start, never been clearly defined.

Scope of the Report

It was agreed, after discussion with the President of the Board of Trade, that the field to be covered should be heavy chemicals, industrial gases, fertilisers, dyestuffs, medicinal and other fine chemicals, explosives, plastics and synthetic resins, but not the compounding of chemicals to make such products as paints, insecticides, sheep and cattle dips and pharmaceutical preparations. Synthetic fibres and rayon are not included, but the chemical raw materials used in their manufacture are considered in the appropriate places.

Notwithstanding the statistical value of the 16 chapters which precede it, much of the interest of the report is contained in the final chapter " The Future of Chemical Industry " in which the import of much that is recorded earlier is interpreted and commented on authoritatively. Here also is made clearer the part of chemical producing industries in the general economy and some of the factors, beyond their control, which tend to impede the full development of undertakings depending more than almost any other upon private initiative and spending on research proportionately a larger sum than is given to chemical research in the U.S.A.

The ABCM's observations in the final chapter are in these terms:—

The primary object of this report has been to ascertain whether the plans of the British chemical industry are adequate to the part it has to play in the national economy. It is considered that the data recorded, and the various proposals outlined, make it possible to answer this question in the affirmative.

Willing Co-operation

Most of the information (in Chapters V to XVI of the full report) results from an inquiry by the ABCM of its own members, of members of the allied associations (The British Colour Makers' Association, British Sulphate of Ammonia Federation, Ltd., National Sulphuric Acid Association, Ltd.) and of other firms believed by the Board of Trade or the Ministry of Health to be engaged in chemical manufacture.

Of more than 500 firms approached, over 200 were found not to be engaged in chemical manufacture as defined. Only 22 failed to reply; a number of these are believed not to be engaged in chemical manufacture and 15 of them were not members of the co-operating associations. Together, the 22 firms represent less than 1 per cent of the industry's capital, labour and output.

Detailed replies were received from 272 firms, and it is clear that the facts and figures given in this report accurately reflect the industry's activities. The association appreciates very much the confidence shown by all the firms who have given the information, much of it of a private nature.

These replies have afforded full information about the industry's plans for rehabilitation and expansion and the expenditure to be incurred in giving them effect, about the numbers of staff and operatives in various categories. and about many other matters, some of them highly technical; in addition, details were supplied

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* " Report on the Chemical Industry," the Association of British Chemical Manufacturers, 166 Piccadilly, London, W.1.; 5s.

about the amount of capital employed by each firm—all these data applying to the chemical industry as defined for the purpose of this report.

The capital employed is defined in the manner usual in accountancy, that is to say, it includes issued capital, debentures and loans, with all sums designated capital or revenue reserves for the purposes of the Companies Act, 1948, but less investments other than trade investments. On this basis the total capital employed in the industry at the end of 1948 was £280,687,000.

Labour Employed

In Table VIII the firms have been arranged in groups according to the number of persons employed. It shows the number of firms in each group and their percentage of the total number of firms. The table also includes the corresponding figures, taken from the *Ministry of Labour Gazette*, for the chemicals, explosives, oils, paints, etc., group of industries, and for industry as a whole.

The figures, as recorded in the *Ministry of Labour Gazette*, for industry as a whole and those for the chemical group of industries, are very similar in pattern, but are markedly different from those for the chemical industry as covered by this report, which show a much higher proportion of labour employed by a small number of large firms.

In Chapter I of this report, it is made clear that only the manufacture of chemicals is under consideration, and not their further preparation before sale, whether that involves simple operations like the preparation of compound fertilisers by the mixing of solid powders, or more complex activities, such as the making of paints and lacquers. In point of fact, there are very few firms, if any, exclusively engaged in manufacturing chemicals. Almost all those so engaged also use chemicals to prepare further products by operations that are not themselves chemical within the terms of the present definition, although chemical compounds may well be the most important, if not the only ingredients of the products so made.

To provide the information for which the ABCM asked, the firms replying in detail had to dissect their use both of capital and of labour, so as to include only that proportion employed in the manufacture of chemicals. This has clearly involved an intricate analysis of each firm's activities and the association recognises fully the trouble taken by all of them to ensure that the information returned was as accurate as possible and also related solely to the manufacture of chemicals.

Production Capacity

Thus the information contained in this report does not refer to the total activities of the firms concerned, but only to a part, and to a part that varies greatly from firm to firm. It must be borne in mind that all figures considered here do not relate to the total activities of the aggregate of firms covered, but solely to their activities in the chemical industry as defined, an industry that has no separate physical existence. This fact may well account in part for the abnormal frequency distribution of its size groups.

The most recent figures available for true production are those contained in the partial census of production carried out by

TABLE VIII

COMPARISON OF A B C M AND MINISTRY OF LABOUR FIGURES FOR COMPANIES GROUPED ACCORDING TO NUMBER OF EMPLOYEES

	A B C M Figures				Ministry of Labour Figures for Chemicals, Explosives, Oils, Paints, etc.				Ministry of Labour Figures for all Industries			
	1	2	3	4	1	2	3	4	1	2	3	4
	No. of Companies	No. of Companies (Col. 1) as Per Cent of Total No. of Companies	Total No. of Employees in Companies in Col. 1	No. of Employees (Col. 3) as Per Cent of Total Employees in all Companies	No. of Companies	No. of Companies (Col. 1) as Per Cent of Total No. of Companies	Total No. of Employees in Companies in Col. 1	No. of Employees (Col. 3) as Per Cent of Total Employees in all Companies	No. of Companies	No. of Companies (Col. 1) as Per Cent of Total No. of Companies	Total No. of Employees in Companies in Col. 1	No. of Employees (Col. 3) as Per Cent. of Total Employees in all Companies
0–10	31	11.5	206	0.15				No figures given				
11–24	49	18.3	861	0.60	648	27.6	11,000	3.1	15,640	30.6	262,000	4.0
25–99	89	33.2	4,748	3.35	988	42.1	50,000	14.2	22,440	43.9	1,129,000	17.4
100–499	61	22.8	13,711	9.7	580	24.7	120,000	34.1	10,730	21.0	2,229,000	34.2
500–999	20	7.5	13,832	9.7	78	3.3	52,000	14.8	1,330	2.6	908,000	13.9
1000–1999	12	4.5	17,891	12.6	80	1.2	41,000	11.6	590	1.2	801,000	12.3
2000 and over	6	2.2	90,568	63.9	18	0.7	77,000	21.9	310	0.6	1,181,000	18.1
Total	268	100.0	141,817	100.0	2,342	99.6	351,000	99.7	51,040	99.9	6,510,000	99.9

the Board of Trade in 1946. This gives for the industry's products a value of £212 million. Since that date the industry has expanded considerably; on the other hand, the Board of Trade definition is wider than that adopted in this report but it omits fertilisers and explosives.

The nearest estimate to be safely made is that the industry, as defined in this report, probably produced in 1948 chemicals to the value of at least £250 million, though production capacity at the end of 1948 was £347 million.

At that date, 142,000 employees utilised a total capital of £231 million with an annual production capacity of £347 million, whereas according to forward plans only 25,000 additional employees will be required to operate new capital expenditure of £191 million, with an additional production capacity of £223 million. Expressed per employee, this is as follows:—

	Per Employee	
	Capital £	Production Capacity £
Existing plant	1,600	2,400
Additional plant	7,600	9,000
Overall existing and new plant	2,500	3,500

These figures cannot be the result of exact computation and are subject to a number of qualifications. Compared with new expenditure, the capital employed in existing plants is assessed much too low, for it computes plant now installed at "book values," that is, original values—often pre-war—less depreciation and these are far below replacement values. On the other hand, it also includes capital locked up in stocks of raw and finished goods, together with any excess of debtors over creditors.

Capitalisation

No available information allows a suitable correction to be made; in terms of today's values, it seems likely that the real capital employed in the industry is under-estimated by £150 million to £250 million. Again, it should be pointed out that the capacity to produce is based upon product values at the end of 1948 and these may not persist. Accepting that the figures are of necessity only rough estimates, the effects of the movement towards greater mechanisation, larger plant units and continuous processes (to which more detailed reference is made) are clearly shown by the marked increase in the ratio both of new capital and of new production capacity to manpower.

That the volume of production of the industry has been steadily increasing there can be no doubt. Evidence of this is available from various sources. Comparison of the figures for the chemical, dyestuffs and drugs trades contained in the 1935 Census of Production with the 1946 partial Census of Production is made in the preliminary report No. 4 on the latter. To permit direct comparison, the figures for 1946 have been converted to 1935 values by using ratio given verbally by the Board of Trade of 100 (1935) to 200 (1946) in the following table:—

TABLE IX
OUTPUT OF THE CHEMICALS, DYESTUFFS AND DRUG TRADES—PRIVATE FIRMS

Values in £'000	1946 Value	1946 Converted to 1935 Values Value	1935 Value
Production (gross output)	212,217	106,108	65,642
Materials, fuel and electricity used	116,744	—	30,849
Net output	94,456	47,228	34,038

The above figures support the Index of Industrial Production compiled by the London and Cambridge Economic Service, which indicated that the output of the chemical and allied industries in 1946 exceeded that of 1935 by almost one-third. The same service estimates that the year 1948 showed a further increase of 17 per cent over 1946. Confirmation of this estimate is to be found in the Interim Index of Industrial Production published by the Central Statistical Office, which puts production for the "chemical and allied trades" in 1948 at 20 per cent above that in 1946.

Greater Output

The forward plans for the industry provide for a further increase in production capacity of 70 per cent during the five years from the end of 1948. Making allowance for tentative schemes that may not come to fruition by 1953, there are reasonable grounds for believing that the rate of increase in production attained during 1947 and 1948 will be maintained for at least the next three years. In 1951 the output of the industry should be 50 per cent greater than in 1946.

There are not available adequately detailed statistics dissecting chemical imports in such manner as to make possible a strict estimate for the chemical industry as defined by this report. Useful indications can, however, be obtained from Class III, Group O—Chemicals, Drugs, Dyes, and Colours—in the Trade and Navigation Accounts. Under this heading the value of imports and re-exports has been as follows:—

Value in £'000	1938	1946	1947	1948
Value of imports ...	13,613	17,789	26,719	31,402
Value of re-exports	463	791	647	781

The large increase in value of imports between 1938 and 1948 is solely due to increase in prices. When the appropriate adjustment for price increase (1938, 100; 1948, 238) is applied, the volume of imports in 1948 is found to have been slightly less than in 1938.

Some chemical imports also occur in Class III, Group U (Plastics). When these are added, the retained imports for 1948 were £35,496,000, of which the main items were as follows:—

	Value (£'000)
Potassium compounds	7,085
Extracts for tanning	3,163
Carbon blacks	2,700
Fertilisers (superphosphate, etc.) ...	2,224
Casein	2,003
Other plastic materials	1,738
Ethyl alcohol	1,532
Celluloid	1,134
Synthetic organic dyestuffs	1,015
Chemical manufactures unenumerated	6,886
	29,480

The main sources of these imports were U.S.A. (£12 million) and Germany (£5 million); the balance was spread widely among many other countries.

Limiting Imports

Imports of chemicals fall into two main categories:—

(a) raw materials or the products of raw materials available overseas but not in this country;

(b) manufactured products made in the U.K. in insufficient quantity or not at all.

In general, there are no alternatives for the first group and such importations must continue.

There is, however, one very important possible exception to this, affecting the largest single import—potassium salts. There are indications of rich deposits of potassium salts in Yorkshire. These are, however, of such nature and at such depth as to present great engineering and other technical difficulties, though there is reason to believe that these may be overcome. It must, however, be some years before this enterprise can be brought to successful commercial production and continued importation of potassium salts is thus temporarily unavoidable.

During the past year the ABCM has made a detailed study of chemical imports falling within the second group; so far as the limited available statistics permit any conclusion, it appears that a very substantial part of the avoidable imports will be replaced by home manufacture, with a considerable saving in dollars, as soon as the schemes of expansion now in progress have been completed.

Certain imports, however, reflect special concessions made by the U.K. Government when negotiating trade agreements with foreign countries, sometimes without consulting the industry. Examples of this are recent imports of benzene hexachloride and also of certain dyestuffs, for similar products were being manufactured in the U.K. on a scale adequate to meet the domestic demand at reasonable prices. The need for close consultation with the industry is emphasised, if its forward plans are fully to materialise.

When all schemes for expansion are completed, the manufacturers forecast a reduction of imports by £28 million. This figure is probably too high, owing to some duplication of import saving anticipated by different manufacturers operating in the same field; nevertheless, a reduction of imports by one-half is a conservative estimate.

The Trade and Navigation Accounts (Group III (O)) give the figures for exports (excluding re-exports) thus:—

	1938	1946	1947	1948
Value in £'000's ...	22,280	66,086	67,426	83,670

When corrected for change in value, 1948 exports represent an increase of 56 per cent by volume over 1938. The export target set by the Board of Trade for the end of 1948 was £8.05 million per month, but the industry fell a little short of this target (December £7.347 million). This was probably due to the increased demand at home for chemicals needed in the manufacture of other exportable goods of higher value, which have a prior claim over the direct export of chemicals.

Export Markets

The distribution of these exports (which exclude plastics) is very wide. The principal markets were India and Pakistan, which together took 13 per cent of the total chemical exports in 1948, Australia 6 per cent, South Africa and Argentina each 4½ per cent. About one-half of the exports went to Commonwealth countries. Outside the Commonwealth our best customers were Argentina, Sweden, Egypt, U.S.A., France, Netherlands and Iran in decreasing order of value. Plastics exports (Group III (U)) were £4,710,000 in 1948.

Exports to U.S.A. present special difficulties. There is in the United States a highly developed chemical industry, protected by an import tariff and having access to an abundance of most raw materials. Chemical exports from the U.K. to U.S.A. have mainly been of basic products in short supply—notably coal tar distillates.

It would perhaps be unrealistic to anticipate any large increase in the export of chemicals to U.S.A.; the reduction of U.S. imports into the U.K. will be a more pronounced feature of the industry's future development. Nevertheless, every endeavour is being made by the industry not only to maintain but to raise the present level of exports to the U.S.A., more particularly in certain specialised products that have been developed in this country.

The prospects in countries in the dollar area with little or no domestic chemical industry are more promising and these markets are receiving close attention. It should be added that in some countries and notably in the U.S.A., there are also possibilities of earning dollars from licensing under patents and the sale of " know-how."

Though a total increase in exports of £49 million, including plastics, is possibly an over-estimate, a very considerable increase is reasonably to be anticipated as the industry's plans progress. The greater use of chemicals in many of the developing countries abroad reflects an overall rise in the standard of living. This may only be attained slowly, but its effect upon the demand for chemical products must be profound and lasting.

[*The section of the original report which followed here has been omitted, as being confidential to the Board of Trade.*]

Adequacy of Industry's Plans

Within the heavy inorganic chemical groups it is possible to forecast overall requirements with some accuracy. There is a long user history—50 to 100 years—showing a steady increase in demand little affected by trade cycles or fluctuations. Expansion of production has been planned in the light of this knowledge and, when the schemes now in progress have been completed, there should be ample capacity to meet normal demands for some years and such fluctuations as past experience indicate to be likely. In both groups the projected increase in capacity is about 50 per cent.

The production of fertilisers in the U.K. has been under constant review by the Ministry of Supply and other Government Departments, in consultation with the manufacturers concerned. Since the end of hostilities the industry has itself given continuous attention to the problems of further expansion in fertiliser production. Manufacturers have had to consider two sets of forces that must affect home and overseas demand respectively, both for nitrogenous and for phosphatic fertilisers.

In the first place, the Government has declared its views on the expansion of agriculture in the U.K. The industry has accordingly planned for such increases in productive capacity as will make it possible to meet the large increase in the home use of fertilisers that must follow implementation of the Government's policy. The plans are indeed already in course of execution and it is clear that they should, when completed, enable the industry to cope completely with the increased nitrogen and phosphate consumption envisaged by the Ministry of Agriculture.

Prospects for Fertilisers

In the second place, vast changes in the world markets may reasonably be anticipated. Among the new factors to be taken into account are those activities of the Food and Agricultural Organisation of the United Nations that are specially directed to encouraging among member nations, especially those whose populations are living at low subsistence levels, an increase in their use of fertilisers of all kinds. It is to be hoped that the advice of FAO supplementing the irresistible pressure of circumstances, may not only lead to the desired increase, but may also encourage the governments of many countries to declare in detail their agricultural policies.

These declarations will make it possible to estimate on a basis of something more than guess-work what are likely to be the world's needs for increased nitrogen fertilisers and therefore the extent to which the U.K. industry can make an increased contribution to them with due regard to the production plans of other countries.

The first report of the Committee on Industrial Productivity (Cmd. 7665, para. 64) has specifically called attention to the present world shortage of nitrogenous fertilisers and recommends that urgent consideration be given to providing additional production capacty. The increases at present planned in production of fertilisers should enable the British chemical industry not only to cope with home demand, but also to satisfy Colonial needs and at least to maintain a footing in other export markets.

It must, however, be remembered that to meet a large increase in requirements for nitrogen fertilisers abroad, particularly in markets outside the Commonwealth, new capital investments will be needed. The decision to undertake them will depend both on an assessment of purchasing power in possible markets and on the level of exportable surpluses foreseen as likely to become available from other countries producing nitrogen fertilisers. There are indications that plans for increased production outside the U.K. will in a short time lead to substantial additional quantities for export.

The progress of modern industrial chemistry is particularly reflected in the production of heavy organic chemicals and to a lesser extent in the pharmaceutical and fine chemical groups. Here the heavy capital expenditures already in hand and projected arise largely from the development of the production from oil of many diverse organic chemicals. The schemes, when completed, should virtually remove the need to import from U.S.A. and should also add very substantially to exports.

Soap Substitutes

A particularly important expansion in this field is that of synthetic detergents. Not only are these products of great practical value in themselves, but their use reduces the demand for soap and thus helps to ease the call on the world's continuing inadequate supply of fats and vegetable oils.

The plastics industry is developing rapidly; indeed, its development may temporarily be in excess of requirements, but the utility of its products seems fully to justify its long-term programme.

The possibility of an unnecessary and therefore undesirable degree of expansion within the chemical industry has not been overlooked and in one or two instances it has appeared that contemplated production might be in excess of ultimate requirements.

While in this report it has not been possible, owing to the confidential nature of the plans submitted, to assess them in detail and while precise prediction of future demand is impossible, the result of the ABCM's inquiry and the study of the information supplied do not suggest any serious danger of wasted effort arising from the industry's present plans.

On the assumption that the plans of the industry for rehabilitation and expansion are accomplished with promptitude, and subject to the reservations about sulphuric acid, so far as can be foreseen it is believed that the industry will prove equal not only to meeting fully the needs of the home market but to eliminating avoidable chemical imports, while also providing a large increase in exports.

Vigour and Courage

" So far as can be foreseen " are, however, words of great importance in the chemical industry, which, possibly to a greater extent than any other, is liable to be affected fundamentally by new discoveries as well as by the general advance of scientific knowledge. What evidence is there that the industry has within itself the resources, vigour and foresight not only to meet the foreseeable future, but also to maintain its position in the longer term?

The industry is now spending on research £8.5 million annually and proposes to expend £11.4 million annually when projects for additional research facilities, involving capital expenditures of more than £8 million are completed.

It is unlikely that this large expenditure on research is exceeded in any other industry; it compares well with corresponding figures in other countries—for instance, in U.S.A. The figures speak for themselves and reflect the initiative believed to characterise the industry.

Courage is an essential element in the expenditure of large sums upon research, the outcome of which may be the evolution of new processes and products replacing those upon which large expenditures are even now being made.

Taxation and Controls

Financial strength to meet such circumstances is a necessity if the industry is to maintain its position in oversea markets in the face of international competition. Taxation at the present levels imposes a severe handicap upon the accumulation of adequate reserves for obsolescence, for which the increased initial allowances provide insufficent alleviation.

During the past decade the chemical industry, in common with many others, has felt the adverse effects of the many Governmental controls. While the need for control of industry by Government during the war is not questioned, the long continued extension of controls, the strict limitation of imports and the existence of a sellers' market—fostered in some degree by bilateral trade agreements—has tended to discourage free competitive initiative, which will again be vital to success as the buyer once more exercises discrimination.

These factors have affected the chemical industry as well as others and the question may well be asked whether, in the face of competition in overseas markets, particularly from U.S.A. and Germany, the chemical industry can, in fact, secure the large increases in export trade for which it plans.

The action that the industry is taking will, it is believed, result in production costs that are internationally competitive, but this alone will not secure exports. There is also needed personal contact with the buyer and first hand knowledge of his local problems, coupled with provision of that technical service to the consumer which has been developed in the home market. For these purposes a wide

(*continued on page* 190)

THE CHEMICAL "IMPROVEMENT" OF FOOD

Medical Council's Case Against Agene

A COMMENTARY on the considerations which were among those which influenced the Ministries of Food and Health to support a recommendation for abandoning the use as a bleaching agent and improver in flour of nitrogen trichloride is contained in the current report (for 1945-48) of the Medical Research Council.

The council comprises this and some associated topics under the general heading "The Sophistication of Food" and observes that the preparatory treatment of ingredients of diet by chemical substances, either to make them more palatable or to preserve them, has become a very extensive practice in western civilisation. In the case of some foodstuffs of importance, equal to milk and butter (to which no chemical addition is permitted) considerable licence is allowed to manufacturers to add chemicals in order to increase the palatability or the keeping qualities of the products, says the MRC.

One of the outstanding articles of consumption in this category is flour and, indeed, cereals in general. In this country flour for human consumption may have been "improved" by treatment with oxides of nitrogen, benzoyl chloride, chlorine dioxide, potassium bromate, nitrogen trichloride or "agene," and ammonium persulphate.

The chemical treatment of such foods makes them lighter in texture and in colour, and more easily masticated.

Toxic Action in Animals

The subject has recently become of greater interest (the report continues) owing to the discovery of a dramatic toxic action, in some animals, of bread made from flour which has been subjected to the "agene" process. Flour is mixed with the gas nitrogen trichloride, and the result is that the flour is bleached and its protein so altered that much larger loaves of a whiter colour and lighter texture can be made from the same weight of flour.

Lest it be thought that this is only an occasional incident in food preparation, it may be added that there is reason to believe that about 90 per cent of all the flour consumed by the population in this country is so treated, and that a similar figure has probably applied until recently to the bread eaten in the United States. The question whether there may be even remote ill effects on human beings from the continued consumption of flour so treated is clearly of great importance.

The report then instances the incidence of canine hysteria and of epilepsy of dogs here and in the U.S.A. and says that it has now been shown that canine hysteria can be caused by the consumption of bread or dog biscuits made of flour which has been treated by the agene process. The most susceptible discovered up to the present are dogs and ferrets, but other animals, such as cats and rabbits, can be similarly affected if the amount of flour they eat has been treated sufficiently intensively with nitrogen trichloride. Monkeys also, although not giving the same gross signs of toxicity, have been found to respond by exhibiting electro-encephalographic reactions typical of epilepsy.

Effects on Humans

Tests were accordingly started on both sides of the Atlantic to see whether any detrimental effects of the treated flour could be observed in human beings. Up to the present, in short-term studies of persons eating bread made from treated and untreated flour, it has not been possible to demonstrate that the former has any acute ill-effects in man. On the other hand, it is more difficult to detect toxic action of a chronic and less dramatic nature, and this remains a real possibility although it has not yet been detected.

Even if scientific research cannot relate the consumption of agenised bread to any known harmful effects in man, there seems a good *prima facie* case for abandoning a method of flour "improvement" which is known to be associated with the production of serious and often fatal disease in animals.

On the other wider question, it is clear that here is a warning, not to be disregarded, on the possible dangers associated with the chemical treatment of food; and it is to be hoped that in the future a much closer watch will be kept on all such methods, and that scientific work will be directed to the detection of possible harmful effects produced by chemical agents which at first sight may seem innocuous.

Beryllium Hazards in Industry

Work of the Toxicology Research Unit

THE toxicity of beryllium was one of the first scientific problems to be studied by the Toxicology Research Unit, Porton, Salisbury, established by the Medical Research Council early in 1947.

The report of the unit's experimental investigation of toxicological problems, with special reference to industrial hazards is contained in the Report of Medical Research Council, 1945-48 (Cmd. 7846).

Contrary to earlier reports from the U.S.A., it has been shown that beryllium in the form of its soluble salts has a high degree of specific toxicity. A satisfactory method for the microdetermination of beryllium in body tissues was developed after considerable difficulties had been overcome.

The acute liver necrosis that follows the intravenous injection of small doses of beryllium salts has been shown to depend on a rapid focal concentration of the metal within the liver; it is this liver necrosis that causes death in such cases.

Malignant bone tumours have been produced in rabbits by injecting the chemically insoluble beryllium silicates—a finding which confirms earlier American work.

In 1947, deaths among workers spraying fields with dilute solutions of dinitro-*ortho*cresol, used as a weed killer, led to a demand for more knowledge about the toxic effects, of this compound, which was known to stimulate metabolism.

Experiments with animals have shown that its toxic action is an acute one, and there is no evidence either of a cumulative effect or the development of tolerance. High environmental temperatures raise the death-rate of animals exposed to its action.

An attempt is being made to follow the metabolism of dinitro-*ortho*cresol, in the hope of being able to detect the excretion products in the urine by a simple reaction.

More recently, work has been started on the toxicity of the new organic phosphorus compounds which are being manufactured and distributed as insecticides. Many of these compounds are known, and their toxicity to mammals and insects varies very widely, although their action in general appears to be similar. Their toxicity by inhalation and by ingestion is being examined and an attempt is being made to learn more more about the disturbances they produce in the body.

The need for a comparative study of the efficiencies of various types of sampling apparatus was emphasised in the report from groups for research in industrial physiology at the London School of Hygiene and Tropical Medicine (Special Report Series No. 244).

A critical investigation of this nature has been undertaken by Mr. C. N. Davies; a satisfactory technique for obtaining a standard cloud of coal dust, with particles ranging from 1 micron to 10 microns in size, was perfected, and this is being used to test the sampling efficiency of different instruments.

Theoretical work on the impingement of dust is also being carried on. A study of fibrous dust filters has been made, and a note on resistance characteristics published.

REPORT ON CHEMICAL INDUSTRY

(*continued from page* 188)

extension of oversea services and oversea companies acting as the spearheads of British chemical manufacture will be increasingly called for.

In pursuance of these aims, the industry must co-operate with the nationals of other lands. For this purpose there is necessary not only a rapid relaxation of the various restrictions on oversea operations suffered by British chemical industry, but also the maintenance by that industry of methods and organisation that will make it an acceptable partner to oversea associates.

In conclusion, those responsible for this report are convinced that in this immensely complicated industry, or series of industries, in which the threads of chemical science are woven into so many and so intricate patterns, and which is, as has already been said, a continuous venture into the unknown, an industry which has its contacts and associates in many lands and which both at home and abroad is intimately bound up with a wide network of marketing organisations, the national purpose will best be served by the utmost freedom of enterprise, and that only thus can the plans which are outlined in this report bear full fruit.

Drugs and Fine Chemicals in 1949—II

The Search for Cortisone

by G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

THE search for suitable plant sources of raw material of cortisone is being prosecuted on a scale commensurate with the importance of what may be wrested from this brand of research. American and British teams are in the tropics studying likely flora. A British expedition, which includes a botanist from Kew, is reported to have been flown to Nigeria (*Chem. and Drug.*, 1949, November).

Marker & Applezweig (*Chem. and Eng. News*, 1949, *27* (16), 3348) have surveyed steroidol sapogenins as a possible source of suitable cortical steroids. They point out that the search is basically for steroids with substituents in ring C of the steroid nucleus. Such sources are presented by the bile acids; digitalis glycosides (which would yield only minute amounts); sarmentogenin isolated in uncertain and variable amounts from the exotic vine already referred to: jervine—the alkaloid of veratrum, of which the chemical structure is still in doubt.

Yield of Sapogenins

They indicate that, by contrast, sapogenin-bearing plants are widely spread and acclimatised to temperate conditions in the wild state. Yield of sapogenins as high as 10 kg. per ton of plants are claimed to be obtainable.

Marker has studied exhaustively side-chain isomers of some of these sapogenins, including botogenin, referred to above, and some of these have been converted to the corresponding 16-dihydropregnane derivatives, via the corresponding *pseudo*-sapogenins. Of these sapogenins it is claimed that botogenin is the most readily convertible into cortisone since the required ketone is produced merely by oxidation.

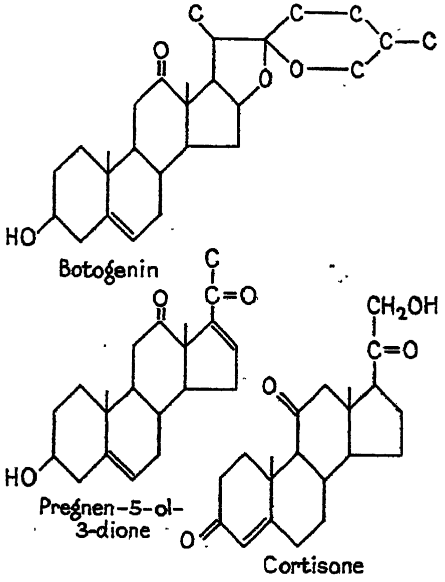
R. R. Williams (*Chem. Eng. News*, 1949, *27* (47), 3516), commenting upon the above suggestions, regards these proposals as highly suggestive, but too optimistic.

To present an idea of the magnitude of the problem, he points out that the soya bean is widely in cultivation, yet the stigmasterol from the whole of the U.S.A. crop would be insufficient, on any reasonable assumptions regarding conversions, even if a good method were available for introducing the desired oxygen into the C ring.

Marker has also summarised the problem elsewhere (*J. Amer. Chem. Soc.*, 1949, *71*; 2656). The fundamental objective is to introduce a ketonic oxygen at C11; but no sterols with such an arrangement are known to occur in nature in large quantities. The reason for using bile acids at present as raw material is that a hydroxyl group can readily be introduced into the desired position (Marker and Lawsen (*J. Amer. Chem. Soc.*, 1938, *60*, 1334).

Synthetic Production

The production of cortisone (11-dehydro-17-hydroxy-corticosterone) from this intermediate gives low yields at two particular steps, one of which is associated with the elimination of the side chain and the other with the introduction of the double bond in ring A. Marker sets out in this paper details of the various synthetic steps leading from the naturally occurring botogenin to pregnen-5-ol-3-dione-12:20-acetate, which is now to be regarded as a starting material for cortisone with ketonic group at C-12 and the double bond in the desired position:—



Botogenin

Pregnen-5-ol-3-dione

Cortisone

Marker has for many years been a leader in the field of sapogenin chemistry and was the first to characterise botogenin (*J. Amer. Chem. Soc.*, 1947, *69*, 2397).

Sir Robert Robinson (*Nature*, 1949, *164* (4181), 1029) in his anniversary address to the Royal Society has made an estimate of the prospects for cortisone synthesis. His view is that the partial synthesis from sarmentogenin (and, presumably by implication, from botogenin) is too long for the type of production required. He considers that there are three promising lines of exploration, which are:—

1. Total synthesis.
2. Synthesis of an effective analogue.
3. Synthesis of a substitute.

In respect of the third suggestion, he thought this might follow the lines that the anterior pituitary gland (otherwise the *hypophysis cerebri*, a small gland the size of a pea, lying on the underside of the third ventricle of the brain and responsible for the control and development of other endrocrine glands) produces an adrenocorticotropic hormene (ACTH) which stimulates the adrenal cortex to secrete its own cortisone.

In fact, the administration of ACTH has also been a means of alleviating the symptoms of rheumatoid arthritis, and, in common with cortisone, has given dramatic relief so long as injections are continued; remission occurs as soon as administration is discontinued.

Peptide Synthesis

Li, at the First Congress of Biochemistry in 1949, announced that he had found that a partial hydrolysate of ACTH contained a peptide with a small number of amino groups which showed an activity similar to ACTH. Sir Robert suggested that it might be found that the synthesis of such a substance as this peptide might be found practicable on a fairly large scale.

The possibility of finding an equally effective compound but of a structure simpler than ACTH is being explored by the Rheumatism Research Department of the Manchester Royal Infirmary.

ACTH, itself, is almost as scarce as cortisone. It has been estimated that the anterior pituitary glands from 40,000 pigs would be required to yield 1 lb. ACTH.

It is an interesting point that patients who are suffering from adrenocortical insufficiency can still be forced to secrete adequate supplies of natural cortisone when given injections of ACTH. The nature of the lesion by which the patient fails to secrete cortisone naturally from the adrenal gland is, at present, quite unknown. An interesting biochemical/physiological field is obviously being opened up. In order to obtain an approximately equivalent effect to cortisone in the relief of rheumatoid arthritis, it is necessary to inject 25 mg. ACTH three times per day.

Spies, of the Chicago Medical School, who will be remembered for his chemical work and publications on folic acid, has now contributed studies on substitutes for ACTH and cortisone (*Lancet*, 12/11/49, 980; *ibid*, 7/1/50, 11). He has studied the effect of a series of steroids to ascertain whether or not they have any ACTH-like action. This latter may be conveniently measured by the effect of the injection on the number of circulating eosinophils in the blood.

Eosinophils are cells normally occurring in the blood and readily stainable with eosin. ACTH causes a fall in eosinophil count in normal individuals. The steroids tested were reasonably accessible and were all structurally related to cortisone. They were:—

1. Pregnene-4-triol-(17α, 20β, 21) one-3-diacetate.
2. Pregnane-3:12:20-trione.
3. 17-methyl-Δ^5-androstendiol-3(β):17 (α).
4. 17-α-hydroxyprogesterone
5. 17-α-hydroxydesoxycorticosterone-21-acetate.
6. Desoxycorticosterone acetate.
7. Ergostanyl acetate.

None of these substances caused any decrease in circulating eosinophils. Similarly, none of these substances had any effect on the progress of rheumatoid arthritis. What stands out, therefore, is that the effect of cortisone is very specifically related to its structure.

(To be continued)

New Industrial Films

AMONG recent additions to the library of the Petroleum Films Bureau is "Pattern for Chemicals," which shows briefly how the Shell Petroleum Company utilises refinery gases derived from cracking and the part played by the chemist and chemical engineer in constructing the new by-product substances.

"New Detergents," another film produced by Shell, explains how detergents of increased efficiency are being made from petroleum wax.

Both are sound films and obtainable (in 35 mm. and 16 mm. gauge) to a wide variety of educational and industrial organisations on application to the Petroleum Film Bureau, 29 New Bond Street, W.1.

Metallurgical Section

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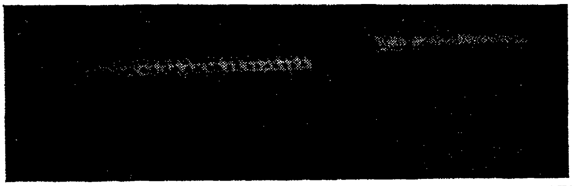

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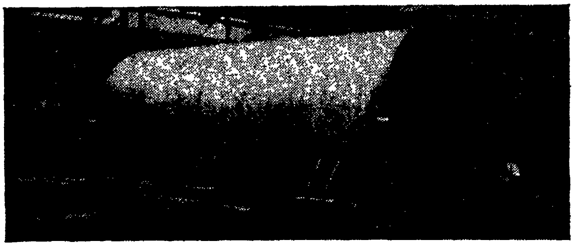

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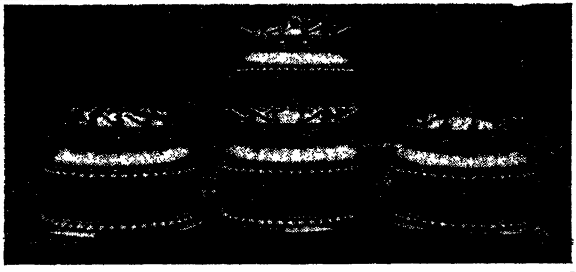

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Metallurgical Section

4 February 1950

STEEL ACHIEVEMENT AND OUTLOOK

Production Target Again Raised

WORLD steel requirements declined during 1949, and this was reflected to some extent by a reduction in output in many countries—notably Belgium and the U.S.A.

In Britain the change was less obvious, but the industry had to adapt itself to new requirements, the main tasks being to achieve greater production and low price. Both these were achieved, output reaching the highest figure ever attained and exceeding the upper limit of 15.5 million tons estimated in the Economic Survey of 1949, while prices were among the lowest in the world.

How this was accomplished and the prospects for this year are described in the recent issue of the British Iron and Steel Federation's *Monthly Statistical Bulletin* (Vol. 24, No. 12) which reveals that production plans for 1950 propose to add some 250,000 tons of steel, to provide a total of about 15.75 million tons.

This observes that the flow of raw materials to the industry during the year proved, in the end, to have been better than had at one time been expected. Particularly was this so of imported iron ore and imported scrap. Such deficiencies as there were could be attributed largely to two factors—strikes in the North African ore mines and the usual seasonal shortage of vessels, aggravated by a North American shipping strike.

Satisfactory Stocks

From the Spring onwards, with the opening of the Baltic ore ports, the situation improved rapidly. By the last quarter it became clear that the year's target would be reached, and stocks are now at a more satisfactory level.

As for the future, the prospects have been made all the more uncertain by the devaluation of the pound, the full effects of which have yet to make themselves felt.

Supplies of both coal and coke to the industry during the year were adequate. The quality, however, left much to be desired; especially was this so of blast furnace coke. The introduction of larger and more modern furnaces had made it imperative that quality be maintained.

As the most important industrial consumer of coal, the steel industry also saw the average price of coal raised on May 30, 1949, by 7d. a ton, that of coking coal by 6d., and that of blast furnace coke by 1s. 9d. These increases were not passed on to the consumer.

Economics and Development

The re-equipment of the industry, as projected in the development plan approved in its broad outlines by the Government in 1946, gathered pace during the year. No plan intended to be executed over a fairly long period could be strictly adhered to in every detail as the years went by; and the industry's reconstruction schemes had inevitably been subject to review in the light of changing economic and technical conditions.

Of the major schemes contained in the development plan as drafted in 1945, some 65 per cent (in terms of monetary cost) had received the detailed approval of the Iron and Steel Board or, since the latter's dissolution on March 31, 1949, the Iron and Steel Division of the Ministry of Supply. Of the schemes thus approved, about 25 per cent were completed and were already contributing to production; 72 per cent were in active execution; and in the case of the remaining 3 per cent work had not yet begun on the site.

The good relations between mangements and labour, for which the industry is noted, were again evident in 1949. Wages were high; there was almost complete freedom from dispute and steady progress was made in joint consultation.

Several completed development schemes should contribute to provide the increase in 1950 to 15.75 million tons; notably the reconstruction of the melting shop at the Round Oak Works, Staffs., where capacity will be raised from 160,000 tons a year to 250,000 tons; the installation of a new blast furnace, ore handling plant and melting plant at the Skinningrove Works, North-East Coast, where ingot capacity will be increased by nearly 100,000 tons a year; and the installation of a new open hearth furnace plant at Stewarts & Lloyds, Corby, where capacity will be raised by 140,000 tons a year.

The greatest increase in capacity represented by any single development scheme is that at Margam, which will raise the total capacity of this works to over one million tons a year in 1951.

Progressive Reduction of Imports

There should be a further reduction in imports in 1950, which should fall from the 1.2 million ingot tons reached in 1949 to about 850,000 ingot tons. An approach will thus be made to the level of 500,000 tons regarded in the development plan and in all subsequent international discussions as the normal import requirements for the early '50's, under conditions of full employment.

The report foresees that, after the increase of 1.2 million tons registered in the past two years, stocks may well come down. The increase in stocks in the hands of producers had been due, in part, to the exceptionally high imports of 1949. Now that imports are falling again, a reduction in stocks of about 600,000 tons might be effected in 1950.

The total amount of steel thus made available for consumption in 1950 should be of the order of 17.7 million ingot tons, an increase of one million tons over the quantity available in 1949. An official estimate has assessed demand round about 1953, assuming full employment, at 18 million tons—14.5 million tons for home use and 3.5 million tons for exports; supplies, therefore, should be falling not far short of this figure even next year.

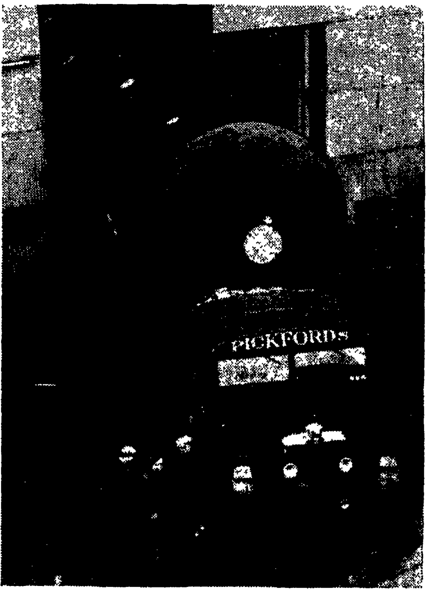
The cuts in capital expenditure announced by the Government after the devaluation of the pound will mean a shrinking in 1950 in the demand for steel for home investment; on the other hand, still more steel will be needed for indirect export by the steel-using industries.

For all home purposes there should be needed about 14.7 million tons, compared with 14.8 million tons in 1949, leaving a margin of 3 million ingot tons available for direct export. The steel most easily exported directly is, in the main, the heavy steel, the demand for which has been affected by the Government's policy in capital investment.

To export steel to the dollar area will, of course, not be easy, though the contracts for $16 million worth of products received from Canada over the next 12 months—a doubling of the present rate of export to that country—are an encouraging sign. There is no reason why this increase should not be made permanent, for British steel shipped to Canadian coastal districts is fully competitive with American steel imported overland.

The BISF emphasises that in the four-and-a-half years which have followed the end of the war the iron and steel industry has played a notable part in the rebuilding of the national economy. That this is so is due to the industry's success in improving its capacity and in presuming the requisite supplies of raw materials, though the cost of these threatens to be one of the major difficulties of 1950.

Leviathan Emerges



[Copyright, Anglo-Iranian Oil Co., Ltd.

The fractionating column built by the Motherwell Bridge and Engineering Co. for Scottish Oils, Ltd., setting out on its 60-mile journey from Motherwell to Grangemouth. A special route had to be mapped for this massive piece of engineering 98 ft. long, 13 ft. in diameter and weighing 66½ tons

DEVELOPMENT OF POWDER METALLURGY

*Important Contribution of the Metallwerk Plansee**

THE development of the important metallurgical factory at Reutte, in the Austrian Tyrol, of the Metallwerk Plansee, is closely bound up with the rise of powder metallurgy, and it may well be said that the technique of sintering has been contributed to in no small measure by the research work of this establishment.

There are numerous reasons for the growing importance of powder metallurgy, among which are:—

(1) Some metals like tungsten, molybdenum, tantalum and niobium have such high melting points that they cannot be produced by melting, on account of the lack of the suitable crucible materials. The sintering process offers a way of producing these materials in a ductile form.

(2) In the powder metallurgical process the material does not come into contact with any contaminating crucible material or slags, and therefore the purest metals can be obtained, for instance purest iron, nickel, and various alloys for the high-vacuum technique.

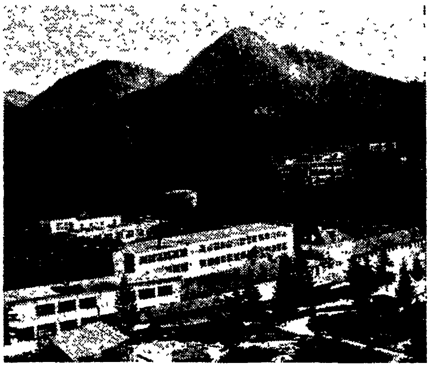
(3) All sintered metals are more or less porous and can be used as materials permeable to gas and fluids, for which a certain porosity is desired, as for oil-charged bearings, filters, diaphragms, etc.

Producing Diamond Materials

(4) Certain metals cannot be alloyed in a liquid state by melting on account of their different melting points and immiscibility. The most important contact materials, tungsten-copper, tungsten-silver, silver-nickel, etc., can be produced only by means of sintering. One can thus produce metal-carbon and diamond materials, the components of which are otherwise immiscible.

(5) The production of hard metals, based upon WC-Co and WC-TIC-Co, is only possible by the sintering process, *e.g.*, tungsten carbide (WC), as otherwise they decompose by melting into W_2C, WC and graphite.

(6) Economical reasons are also often deciding factors for using the sintering process. The production of sintered iron and sintered steel moulds and of sintered magnets are examples where powder metallurgy competes with other methods.



General view of the Metallwerk Plansee

The Metallwerk Plansee produces, with few exceptions, all these groups of powder-metal materials. The steadily increasing demand for tungsten, and more especially molybdenum, for incandescent lamps, Röntgen tubes, and for the radio industry, which developed such impetus after the first world war, induced Dr. Paul Schwarzkopf, an Austrian, to establish in 1921 these metal works. Before that, he had already had experience in the field of high-melting metals as founder and partner of the Deutsche Glühfadenfabrik Richard Kurtz and Dr. Paul Schwartzkopf, Berlin.

The district between the Austrian Tyrol and Bavaria has the advantage of plentiful and cheaply produced electric energy, so necessary for the production of the high-melting-point metals, from the nearby hydro-electric plant of the borough of Reutte. From a small beginning, when the works employed only 50 persons, it has now grown into an establishment which is among the best known of the powder metallurgical plants of the world.

The initial products were mainly molybdenum wire and sheet for the incandescent lamp and radio valve industry, also tungsten parts for Röntgen tubes. The sintering process now applied to molybdenum was developed on the basis of the original experiments by W. H. Wollaston, the research of Auer von Welsbach, F. Skaupy and others, and was brought in 1908 to technical efficiency by the American C. Coolidge.

Prior to the 1914-18 war, tungsten and molybdenum wires were already produced

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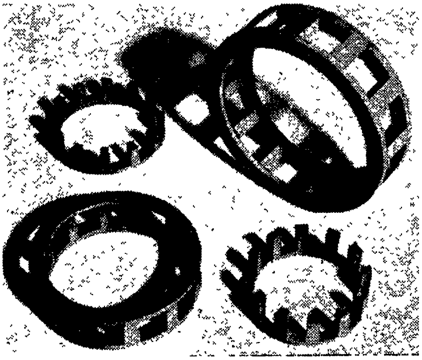
* Abridged translation from a report by Dr. R. Kieffer and Eng. F. Benesovsky, the *Journal of the Technical Museum*, Vienna.



Sintered roller-beds

in all important countries for incandescent lamps. The demand increased after the war in line with the development of the electronic valve technique and the radio industry, to such a degree that the newly formed Plansee establishment set up a subsidiary plant in Sill, south of Innsbrück, which was intended for the production of molybdenum, tungsten and other high-melting-point metals and alloys.

The production of materials and metals for high-vacuum purposes demands the purest raw materials. The production of refined molybdenum and tungsten trioxide, the starting product, was found to be comparatively difficult by chemical means, but the process of P. Schwarzkopf and A. Schmitt for the sublimation of molybdenum acid, produced in a simple way the purest molybdenum trioxide from impure raw materials (roasted molybdenum ore and residues, etc.).

As molybdenum acid evaporates at 700°C. it is impossible to obtain at this temperature a separation from impurities not yet volatile. Repeated experiments to produce purest tungsten trioxide by sublimation failed, as the accompanying oxides gave at the distillation temperature of Wo_3 (about 1400°C.) a too high steam pressure.

Tungsten and molybdenum were soon used, in addition to the lamp and valve industry, as heating elements in high-temperature furnaces in the form of wires and ribbons. This was mainly due to the work of P. Werner and F. Krall, of Reutte. Most of the high-temperature sintering, muffle and hammer furnaces now in use are fitted with molybdenum heating elements.

Its connection with the high-vacuum technique and related industries induced the Plansee company (in 1930-35) to produce further materials by sintering. The research work by I.G. Farben scientists, particularly L. Schlecht, W. Schubardt and F. Duftschmidt, resulted in 1931 in obtaining very fine and pure carbonyl-iron powder by decomposition of iron carbonyl. This powder, for which at first no demand was noticeable, is most suited for the production of pure alloys by the sintering process.

This was produced by the Plansee works under the trade name of Ommet-iron to serve as electro-deposited material in high-vacuum tubes. Some other alloys which can be sintered by use of carbonyl iron and carbonyl nickel powder are on the market as Sivar melting alloys with iron-nickel-cobalt base, and as Hastelloy alloys with nickel-molybdenum and iron-nickel-molybdenum base. The latter are mainly used in the form of wire for lattices in electronic tubes and as heat-conducting materials.

Carbonyl iron powder soon attained technical importance for the production of soft and permanent magnetic material. The use of lemellar tungsten instead of platinum as a contact material in ignition units for internal combustion motors suggested that tungsten as well as molybdenum could also be used for other similar purposes on account of its high melting point, extreme hardness, the low-welding properties and small loss in burning. A hindrance, however, lies in the rather low electrical conductivity.

By alloying tungsten or molybdenum with good conducting metals, such as copper or silver—which had already been suggested in 1916 in a patent not commercially utilised—one gets compounds which are very suitable as contact materials for high or low voltage switches. These compounds, which cannot be alloyed by a melting process, have been produced since 1932 under the trade name Elmet-Rotung (W-Cu) and Elmet-Silvung (W-Ag).

Sintered Hard-Metal Alloys

The technical production of these contact materials is achieved either by sintering the powder mixture or by impregnating the porous tungsten substances with liquid copper or silver. The fact that the development of sintered hard-metal alloys with tungsten-carbide and tungsten-titanium-carbide basis was very progressive, is due to knowledge of powder-metallurgical methods and of the sintering process.

Basing their research upon the work of W. Lohman, G. Fuchs, A. Kopietz and H. Baumhauer, the metallurgists K. Schröter and F. Skaupy succeeded in

1922 in sintering tungsten-carbide powder with cobalt as a cement and so produced the first technically applicable sintered hard metals. The introduction of this new material has had an effect upon the technique of most metal-working processes.

Sintered hard-metals with Wo-Co base are specially suitable for work on short-shaving metals, for instance, iron and brass, but less so for steel working. The position was, however, changed by the pioneer work of P. Schwarzkopf, I. Hirschel and G. Ballhausen, and especially that of R. Kieffer in 1929-31.

By mixing tungsten - carbide or molybdenum - carbide with carbides of titanium, vanadium or tantalum, and sintering them with cobalt as connecting metal, one obtains hard metals with high tenacity and low welding inclination, which has proved most suitable for steel working even at the highest cutting speeds. These hard metals are patented and marketed under the names of Titanit U1, U2, and U3, and later S1, S2, S3.

Titanit

Together with the DEW-Krefeld, Titanit was utilised in 1931 in the building of the mountain laboratory of the Metallwerk Plansee, where the late Eng. S. Heiss directed the hard metal division. Eventually they took on the production of diamond-metals and hard-metal bound tools according to the processes covered by the patents of R. Kieffer and S. Heiss.

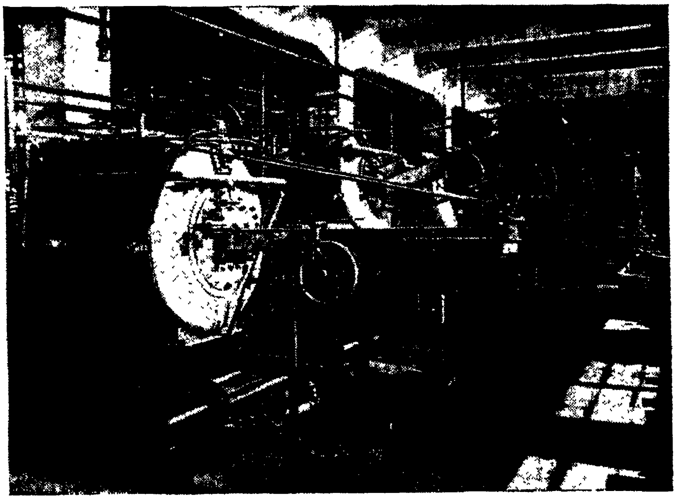
The research work at the Plansee factory, which has contributed so much to the growth and technical importance of powder metallurgy, occurred largely at a time of general economic and political crisis in Austria with consequent export difficulties and scarcity of raw materials. With the over-running of Austria in 1938, the Plansee works were taken over by the DEW-A.G.-Krefeld, and were at the beginning of the second world war incorporated in the general military organisation, remaining exclusively engaged in the sintering of metals. The molybdenum and tungsten production, as well as that of hard-metals and alloys, was increased, and the number of employed persons rose to more than 1000.

Iron-Powder Work

The war period also brought a rapid development of iron-powder metallurgy work. The sintering process thus applied soon competed with other mass-finishing processes, such as temper casting, pressure die casting, precision casting, drop forging, sheet stamping, shaving, etc., and quickly gained a strong position among the different methods of steel shaping. A plant for the production of shell-guiding rings from sintered iron had a monthly capacity of about 120 tons. These items were made from this material on account of its porosity and plasticity.

In the second half of the war, the development of sintered steel was begun and the production of pressed and sintered engine and apparatus parts from iron-graphite powder, whereby the properties of an ordinary carbon steel of some 0.6 per cent content were simulated.

The development of sintered permanent



Tip-up high-temperature sintering furnaces in the Plansee Works, typical of the modern plant being employed in the treatment of a wide range of hard metals and alloys magnets, which was begun in 1935, led during the war to a production of about 12 tons per month by the Kieffer-Hotop process. The Fe-Al-Ni alloy by Nishima, by which parts can be produced by mould or precision casting, can also be substituted or synthesised by single powder components or from specially prepared alloy powders by pressing and sintering. This method permits the production of finished parts which only need a little subsequent work and which, compared with parts from molten alloys, have a finer granular structure.

Two months after the war, the works started again under the management of Dr. R. Kieffer and F. Herold. At first a heat-conducting alloy with Fe-Al basis was produced by sintering, also ceramic parts for electro-technical uses, as well as heating plates and room radiators. A change to peace-time work provided the motor engine and fitting industry with parts from sintered iron and steel. The experience gained during the war was put to favourable use in the post-war production.

Pressed Magnets

The branch works at Sill, which produced exclusively during the war molybdenum and tungsten, extended its production programme with tungsten powder, molten tungsten carbide for welding purposes, and special drawing stones, also titan carbide and carbide mixed crystals for use in the hard-metal industry. The production of sintered magnets was in 1948 moved from Reutte to Sill, where the making of pressed magnets was carried out by the method of Ugine, Grenoble.

The negotiations for the return of the works to Dr. Schwarzkopf ended in 1948 with their restitution. The history of the Plansee works would not be complete without mention of the related foreign enterprises and their importance to the international economy. The N.V. Molybdenum Company, in Amsterdam, a patent licensee and trading company, and the Vereenigden Draadfabrieken, Nijmegen, are working in collaboration with Plansee.

The U.S.A. introduced in 1930 protective tariffs in connection with the import of high-melting-point metals. To safeguard the American market, the American Electro Metal Corporation was established in Lewiston for the production of molybdenum fine wires from semi-manufactured materials of the Plansee works. This U.S. company moved its activities during the war to Yonkers, where it commenced the production of sintered iron, sintered steel, sintered magnets and high heat-resisting materials. Recently a combine with the Cérametal interests, the Société pour la Métallurgie des Poudres A.R.L., in Walferdingen, Luxemburg, was established, which was granted a licence for the production of the hard-metal Titanit according to the Plansee method. For the extension and maintenance of the market in sintered products many licences have been given to other European States.

A company engaged in such a young industry could, of course, only succeed by maintaining constant research, and the realisation of this led in 1940 to the establishment of a central research station. A result of the combined development and research activities was the publication of the book "Pulvermetallurgie und Sinterwerkstoffe," by R. Kieffer and W. Hotop, 1943. Experiences in the field of sintered iron and steel during the second world war were also covered by R. Kieffer, W. Totop, H. J. Bartels and F. Benesofsky in their book (1948) "Sintereisen und Sinterstahl." These two standard works on powder metallurgy and a great number of publications in technical journals contributed much to the reputation of Austrian science and technique. Dr. Schwarzkopf and his collaborators published (1947) in New York the book "Powder Metallurgy," which met with an enthusiastic reception in America.

Light and Measurement

DETERMINATION of length by means of light was one of the many themes demonstrating recent work of the National Physical Laboratory shown at Burlington House this week. If the source of light is a pure isotope of even atomic mass it has been proved by recent research that more nearly ideal monochromatic radiations are emitted than from naturally occurring elements.

One such isotope has been produced by transforming gold into the mercury isotope of mass 198 by exposing it to neutron irradiation in the atomic pile. The characteristics of green light emitted from this isotope are being investigated internationally to ascertain whether its wavelength is suitable for adoption as the ultimate standard of length. Cadmium red light is already employed to determine the standard yard and metre.

The display was part of the celebrations being held to mark the 50th anniversary of the National Physical Laboratory, or more accurately the appointment of its first director, Sir Richard Glazebrook, in January, 1900, which is generally regarded as the date of the foundation of the laboratory.

TECHNOLOGY OF ALUMINIUM AND ALLOYS

Some Applications and Basic Properties

A CLEAR picture of the potentialities and increasing applications of aluminium and aluminium alloy extruded sections and some valuable basic information about the metal are given in the latest information bulletin (No. 16), of the Aluminium Development Association, London.

In applying aluminium alloys the most evident virtues are the range of strengths available and the remarkably high values obtainable by some of the alloys. Tables 1 and 2 in the bulletin give an indication of the mechanical properties.

For many purposes for which high strength is not necessary the softer alloys, which may be manipulated with ease yet have adequate strength and rigidity, are gaining acceptance. Most aluminium alloys are easily machined and cut, and many of them easily welded.

TABLE 1.—NOT SUITABLE FOR HEAT TREATMENT

B.S./Gen. Eng. Series No.	Nominal Compositions	0.1% Proof Stress (tons/in.^{2}) *	Ultimate Tensile Stress (tons/in.^{2}) *	Elongation (% on 2 in.) *	Brinell Hardness (typical)
E1C–M	A1 99% purity	—	4	20	22
NE4–M	1.75–2.75% Mg	—	11	18	45
NE5–M	3.0 –4.0% Mg	6	14	18	55
NE6–M	4.5 –5.5 % Mg	8	16	18	65
NE7–M	6.5 –7.5 % Mg	9	20	18	75

* Specification minima.

Resistant Properties

The corrosion resistance of aluminium is impressive. Aluminium spontaneously forms on its surface a passive oxide film which rapidly re-forms on newly cut surfaces. This film is integral with the alloy and offers considerable resistance to weathering; it is continuous, tough and transparent.

It may be reinforced both by chemical and electrochemical processes. The thicker and more protective films so formed give an excellent base for paint.

All aluminium alloys possess high resistance to the kind of atmospheric attack which occurs in industrial service. In many applications it is not essential to paint aluminium alloys.

Where aluminium alloys are used in stonework it is found, contrary to experience with other metals, that the stone does not become stained.

References to the materials used are those adopted in the new British Standard Specifications for Wrought Aluminium and Aluminium Alloys for General Engineering Purposes.

Grades of pure aluminium and composition of alloys are denoted by numbers. Prefix N indicates non-heat-treatable alloy and H heat-treatable alloy; a second letter denotes the form of the material—E for extrusion, S for sheet, T for tubes. A suffix letter indicates the condition of the material: M = "as extruded"; T = solution heat-treated and naturally aged; W = solution-treated but able to respond to further heat-treatment; WP = solution and precipitation heat-treated. Thus, reference HE10-WP denotes heat-treatable alloy 10 in the form of extruded section and in the fully heat-treated condition.

The methods available for assembling a structure are by bolting, riveting, fusion and resistance welding; the use of brazing and of adhesives for certain joining problems has also been developed with considerable success. The strongest alloys should be spot welded, riveted or bolted together.

Aluminium alloy rivets are available in a number of alloys and in a wide range of sizes and shapes: these rivets should be cold-snapped and considerable mechanical force is required, especially in the larger sizes. It is also customary to use mild steel rivets in certain large constructions, driving them hot, as in steel practice.

Four aluminium alloys are recommended as rivet materials for general engineering purposes, namely NR6-M, HR10-W and -WP, HR13-T and HR14-T. (Tables 1 and 2 give the nominal composition of these alloys.) The ultimate shear strength of mild steel is about 15 tons/in.^{2}, that of NR6-M about 11 tons/in.^{2}, HR10-W 11 tons/in.^{2}, HR10-WP 13 tons/in.^{2}, HR13-T 18 tons/in.^{2} and HR14-T 17 tons/in.^{2}. If HR14, the strongest of these, is used, the rivets must be driven within two hours of quenching from 500°C.

The spontaneous age-hardening which follows quenching can be retarded, however, by storing the rivets (preferably immersed in methylated spirit and water) in a refrigerated box; the two-hour period then begins on removing the rivets from cold storage. For HR14 material, safe storage periods range from 2 hours at room temperature to 150 hours at -20°C. Alloys NR6, HR10 and HR13 may be driven in the "as received" condition, but the shear strength of these materials is lower.

Mild steel rivets are driven hot, and this operation may be carried out without detriment to the properties of the aluminium alloy being riveted, provided the sequence or speed of driving is such that undue heating of any particular part of the structure being riveted does not occur.

Welding Methods

With sections made in the non-heat-treated alloys, joining may be effected by resistance, arc and gas welding methods when the necessary skill has been acquired. Under the best conditions, weld efficiencies up to about 90 per cent of the parent metal strength are obtainable.

The heat-treatable alloys suffer a more marked reduction in strength at the weld owing to the removal, by welding heat, of the characteristic wrought structure and of the heat-treatment effects.

The application of brazing to aluminium alloys has been developed considerably in the last few years and specific recommendations are available for single jobs and for batch operation. Essential requirements are careful pre-cleaning, thorough removal of flux after jointing, and careful jigging.

Synthetic resin adhesives are particularly suitable for aluminium alloys, and an example of their application is in the assembly of textile spinning bobbins. Die-cast flanges and extruded tubes are machined, to an interference fit if required, bearing surfaces are given a thin coating of adhesive, and the two components are then fitted together under pressure. Some bonding processes require both heat and pressure; others, heat only.

The approximate point at which, under tensile stress, permanent deformation of aluminium and other non-ferrous metals begins is known as the "proof stress." The proof stress of a particular alloy is therefore the point on its stress/strain curve which corresponds closely to the yield point on the curve for mild steel, and is used because aluminium alloys show no definite yield point.

In general design practice, reference is made to the 0.1 per cent proof stress, which by definition is "the maximum load per sq. in. that, when applied to a tensile test

TABLE 2.—HEAT-TREATABLE MATERIALS

B.S./Gen. Eng. Series No. or Equivalent Reference	Nominal Compositions	0.1% Proof Stress (tons/in.^{2})*	Ultimate Tensile Stress (tons/in.^{2})*	Elongation % on 2 in.*	Brinell Hardness (typical)	Temperature Range for Solution Heat-treatment (°C.)	Conditions for Precipitation Heat-treatment where applicable	
							Temperature Range (°C.)	Period (hours)
HE9-W	0.4–0.9% Mg 0.3–0.7% Si	5	9	18	48	525–540		
HE9-WP		10	12	12	75	525–540	160	12–14
HE10-W	0.4–1.5% Mg, 0.75–1.3% Si	7	12	18	65	525–540		
HE10-WP		15	18	10	95	525–540	160–185	5–15
HE11-W	1.0–2.0% Cu, 0.5–1.25% Mg, 0.75–1.25% Si	10	17	15	90	520–530		
HE11-WP		20	25	8	120	520–530	170	8–12
HE14-T	3.5–5.0% Cu, 0.4%–1.2% Mg, 0.7% Si, 0.4–1.2% Mn, etc.	15	25	15	120	485–505		
HE15-W	3.5–4.8% Cu, 0.6% Mg, 1.5% Si, 1.2% Mn, etc.	15	25	15	115	505–515		
HE15-WP		26	30	8	145	505–515	155–185	5–20
BS4L25	3.5–4.5% Cu, 1.2–1.7% Mg, 1.8–2.3% Ni	14	24	15	120	490–525		
DTD363A	4.0–8.5% Zn, 4.0% Mg, 3.0% Cu, 1.0% Mn, etc.	33	38	5	155	455–465	130–140	4–8

*Specification minima.

piece for 15 seconds and removed, produces a permanent extension of not more than 0.1 per cent of the gauge length."

For heat-treatable aluminium alloys, proof stress is much nearer to ultimate tensile stress than for the non-heat-treatable materials. The properties can be compared by examining columns 3 and 4 of Tables 1 and 2, and the difference between proof and ultimate tensile stress is of special significance to designers when assessing factors of safety.

The mechanical constants of the aluminium alloys (Table 3) show the elastic modulus of aluminium to be a little more than one-third that of steel. From this a correspondingly greater deflection under load is to be expected, unless the aluminium member is increased in sectional size or some other disposition is made in section design.

For equal tensile strengths, a length of aluminium alloy HE15 would have about the same cross-sectional area as a length of mild steel, but would be less than half the weight; but for members under load, deflecting equally, an aluminium beam of, say, 7 by 4 in. would correspond to a steel beam of 5 by 3 in.

Of these two, however, the tensile strength of the beam in HE15 would be so much greater that—unless extra margin were wanted for another reason—a material of lower tensile strength, such as NE6, might be used.

TABLE 3.—CONSTANTS APPLICABLE TO ALUMINIUM AND THE ALLOYS

Modulus of elasticity (E)	$10–10.5 \times 10^6$ lb./in.^{2}
Torsion modulus (G)	3.8×10^6 lb./in.^{2}
Poisson's ratio	0.33
Specific gravity	Between 2.6 and 2.9
Coefficient of linear expansion per °C (20–100°C.)	$22–24 \times 10^{-6}$
Thermal conductivity (0–100°C.) (C.G.S. units)	0.32–0.53
Specific resistance at 20° C. (microhms per cm. cube)	Aluminium alloys 2.9–5.9 Pure aluminium 2.845 (B.S.215)
Specific heat at 20° C. (cal. per gram per ° C.)	Aluminium alloys 0.22–0.25. Pure aluminium 0.214
Melting points	Aluminium alloys 510–650° C. Pure aluminium 660° C.

Lightness with Strength

The weight saved by using aluminium alloy would in either case be about 40 per cent. An aluminium alloy structure is thus about one-half the weight of a steel structure of equal strength and rigidity.

An advantage of the lower modulus appears when aluminium structures are subjected to shock conditions of loading; then their greater resilience permits the absorption of more energy than is possible with a comparable steel structure.

In the design of short struts under compression, the value of proof stress in tension is used, but for less compact members suitable column or buckling formulæ are applied. Maximum stress in compression cannot be determined for ductile materials such as aluminium alloys.

The ultimate shear stress for an aluminium alloy is about 60 per cent of the ultimate tensile strength, and bearing strength is about equal to the tensile figure. Under fatigue test aluminium alloys, in common with most non-ferrous metals, do not show such a definite fatigue limit as mild steel; although the aluminium-magnesium alloys are a possible exception to this generalisation.

Common practice is to apply a figure of 80 per cent of minimum ultimate tensile stress to structures for which fatigue is not a factor of major importance. In other circumstances, if published information is not available, the supplier of the material should be consulted for data on which to base calculations.

Notwithstanding the difficulties extremely complicated shapes are produced by the extrusion process.

From the user's point of view, extrusions offer a number of features that are not available in rolled shapes. It is possible to obtain sections which have re-entrant angles; to have considerable variations of thickness in different parts of the cross-section of extrusions, and to obtain hollow sections. No taper or draw is normally necessary, as in the case of rolled sections.

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NEW USES FOR PTFE

Protection of Chemical Equipment

THE constantly widening field of industrial applications of CF_2—the thermoplastic material prepared by the controlled processing of polytetrafluoroethylene (THE CHEMICAL AGE, *60*, 10)—was the subject of a demonstration at a reception in London last week by the makers, Crane Packing, Ltd.

The products to which attention particularly was directed were gland packings, pipe jointings and valve seatings, developed for use with chemicals and acids of a highly solvent or corrosive nature (THE CHEMICAL AGE, *61*, *699*).

It was also shown that CF_2, moulded into gaskets of any required size, is an effective means of providing protection at the joints of pipes or tubes in acid pumps, etc.

Gland packings of this material are stated to be unaffected, within the temperature range—60° F. to 450° F., by contact with inorganic acids, oleum, plating solutions, caustic alkali solutions, HCl gas, SO_2, SO_3, oxides of nitrogen, all halogen gases except fluorine, and oxygen.

For less severe conditions there are other packings, such as those constructed by spirally wrapping or braiding CF_2 tape around a core of suitable material, or those composed entirely of tape in braided form.

In tape form the thermoplastic is an efficient insulator at high ambient temperatures. It is thermally stable and possesses good electrical properties.

The density of CF_2 in moulded form is 2.2 and its tensile strength 2000 p.s.i. (The super-tensilated form has a strength of up to 15,000 p.s.i.). Elongation is from 50-400 per cent. The power factor is claimed to be 0.0002 and the dielectric constant 2.1 over a wide range of frequencies.

The main disadvantages of CF_2 are its comparatively high cost at present and the fact that, when subjected to very high temperatures, it disintegrates and gives off toxic fumes.

Swiss Chemical Exports

Swiss exports of chemical and pharmaceutical products (in million Swiss francs) amounted to 504.4 in 1949, compared with 547.6 in 1948 and 166.5 in 1938. Although aniline dyes and indigo receded from the 1948 peak of 260.1 to 212.2 (88.0 in 1938) they still occupy the first place among the four main groups of chemical exports. Shipments of industrial chemicals declined from 81.7 to 70.5 (22.8 in 1938).

CANADA'S CHEMICALS

Full Supply for Home Uses

FOR the first time in almost a decade, production of industrial chemicals in Canada in 1949 was generally sufficient to meet demand, according to George W. Huggett, chairman and president of Canadian Industries, Ltd., in a survey of the chemical and allied industries. As a result of the improvement in the supply of some chemicals, there had been a shift in emphasis from production to the development of markets in order that capacity operations could be maintained.

Imports had increased in proportion to the higher level of chemical production.

The CIL chairman states that the rate of increase in costs showed signs of moderating and the selling prices of some chemical products dropped, but most of these trends had been reversed by the devaluation in September of the Canadian dollar.

The chief contributory factor in the better supply position was the additional plant capacity provided by postwar expansion. Henceforth, a larger portion of capital expenditure would be devoted to the erection of plants for the manufacture of new products or of chemicals formerly obtained from abroad.

Fischer-Tropsch Principles in U.S.A.

HAVING completed arrangements with Ruhrchemie and Lurgi for licenses and access to all process information developed by these German firms, the Blaw-Knox Company, Pittsburgh, Pennsylvania, has formed a chemicals and fuels synthesis department which will deal principally with the conversion of fuels into chemicals based initially on the Fischer-Tropsch and related processes. Ruhrchemie pioneered the development of the Fischer-Tropsch production of gasoline from synthesis gas derived from coal, while Lurgi built plants of this type and contributed to coal gasification.

The Fischer-Tropsch process can use any one of a number of raw materials as a source for the intermediate feed material, synthesis gas. Blaw-Knox visualises opportunity in the construction of highly integrated units for the synthesis of valuable chemicals and oils from natural gas and possibly other economical fuel sources.

Technical Publications

INCREASING importance has been attached in recent years to the chemist's part in the progress of processing food and the production of its raw materials. The Society of Chemical Industry has now attained a long-cherished ambition in the publication of a monthly periodical of the *Journal of the Science of Food and Agriculture* (January, 1950) now available. Lord Bruce contributes an article on " The World Food Situation and the Work of the FAO." Other features include: " The Enzymatic Degradation of Ascorbic Acid—Part I," by F. C. Hooper and A. D. Ayres, and " A Method for Improving the Keeping Quality of Bread," by R. S. Alcock and J. King. There are messages of welcome from the Ministers of Food and Agriculture and from the president of the society.

* * *

" CHEMISTRY," according to Duclaux, " is the basis of everything, and nothing escapes it." The need for international co-operation in the all-embracing science was recognised by the formation of the International Union of Pure and Applied Chemistry, the origins of which are recalled in the January issue of *Endeavour* (Vol. 9, No. 33) by Prof. R. Delaby, who also describes its present structure and shows its active participation in scientific progress. Other features include: " Cyclo-polyolefins and Related Molecules," by Prof. Wilson Baker, and " Plant Cancer " by R. J. Gautheret.

* * *

THE application of physics in industry has been one of the particular concerns of the Institute of Physics since its foundation in 1918. It has now been found possible to start a monthly publication devoted specifically to this subject, the first number of which, *The British Journal of Applied Physics* (January), has just been issued. Included are special articles by Sir Philip Morris on " A Scientific Education," and " Some Chemical and Physical Properties of Rubber" by J. Moore, and a number of original papers and reviews of new books.

* * *

" DO'S and Dont's " for the process of vitreous enamelling are set out in a booklet just issued by the Vitreous Enamellers' Association with the co-operation of the Council of Industrial Design. While many of the precautions appear somewhat elementary their recommendation by the Vitreous Enamellers' Association indicates that their observance is not as widespread as might have been assumed.

* * *

THE present (22nd) edition of "Chemical Industries " (Dr. E. N. Tiratsoo; Leonard Hill, Ltd.), has been completely revised. There are some 4500 references and cross-references in the index to technical data, and the data of organic and inorganic compounds lists some 2000 chemicals. The classified index has been divided into two sub-sections—chemicals and plant. A new feature is a section devoted to refrigeration supplementing those dealing with fuels, power production and transmission, and water treatment, added in 1948.

* * *

FROM the chemical point of view, the action upon a metal surface either of milk and milk acids, alkaline detergents or the strong hypochlorites used for sterilising is a factor of much importance. Experience has shown that no such chemical action occurs on stainless steel pipes. Their uses

(*continued at foot of next page*)

COLD-WELDED ALUMINIUM

These flanged containers are formed from aluminium slugs by impact extrusion. The welding faces of the flange and the disc lid are welded in one quick operation by cold pressure welding

[Photograph, General Electric Co.

Targets for Fuel and Power Research

Work of the Chief Scientist's Division

THE responsibility of the Ministry of Fuel and Power in encouraging and co-ordinating the development of research throughout the whole of the fuel and power field was explained at a Press conference in London last week.

The main objective of his division, to achieve the most economical integration of fuel and power services, was explained by the chief scientist, Dr. H. Roxbee Cox, who also described some of the main items at present being investigated.

Some difficulties, he said, had been experienced in the horizontal boring for the underground gasification of coal at a site near Chesterfield (THE CHEMICAL AGE, *61*, 761) but progress was satisfactory and it was expected to " light up " early this year.

The heat pump, although not a new idea, had received little attention in this country, and the Ministry had considered it worthy of fuller investigation. Calculations had shown that there would be economic advantages in driving the heat pump by gas engines.

Tests were being made with Merlin aero-engines converted to running on town gas. The superchargers had been modified to provide the compression required in the heat pump circuit. It was proposed, with the collaboration of the LCC, to employ such a pump to provide part of the heating for the new concert hall being built on the south bank of the Thames.

Coal consuming, peat gas and firedamp turbines were all being investigated and showed considerable promise in their own spheres.

Survey of fuel consumption in twelve major industries is at present being undertaken. By study of plants and processes it is hoped to enable manufacturers to reduce costs by more efficient fuel utilisation. The industries receiving attention are beet sugar, cement, glass, horticulture, lime-burning, non-ferrous metals, paper, rubber, sanitary earthenware, silk, soap, and wool.

The mobile testing unit for savings in fuel consumption introduced last year (THE CHEMICAL AGE, *59*, 781; *62*, 5 and 129) had been highly successful, and it had been decided to introduce three further units immediately, following the number of requests received for its use.

In view of the benefit received from " bringing the laboratory to the factory," and so that the whole cost should not fall on the public purse, it had been decided that from this month, firms requiring the unit would be asked to make a contribution of £15 each day of use to cover maintenance and running cost.

TECHNICAL PUBLICATIONS

(continued from previous page)

in the dairy industry for food processing and fermentation are described in a brochure just published by the export organisation of Tube Investments, Ltd., London. This is one of a series of technical booklets dealing with the application of high-grade steel tube and metals sections in a particular trade being produced by the T.I. (Export), Ltd.

* * *

A bibliography with abstracts of published reports on Vitamin B_{12} divided into two parts, laboratory and clinical, is now available from Glaxo Laboratories, Ltd., Greenford, Middlesex.

* * *

WEAR, from the scientist's standpoint, is the subject of the article in Operating Notes in " Deco Trefoil " (Vol. 13, No. 6) published by the Denver Equipment Co. The main feature is an article on industrial and chemical applications of froth flotation by Lawrence A. Roe, technical supervisor, division of ore reasearch, Jones and Laughlin Steel Corporation, Negaunee, Michigan.

* * *

THE non-flammable properties of nylon which melts but does not burn, and the urgent need for evolving a non-flammable treatment of cotton fabrics which would be fast to washing, not spoil the " feel " of the material and not be too expensive are discussed by Dr. Leonard Colebrook in an article " Prevention of Burns in the Home " in the January, 1950, issue of the *FPA Journal*, published by the FOC Fire Protection Association.

* * *

A SURVEY of recent and revised British Standards, amendments, future publications and new work started is contained in the December issue of the British Standards Institution monthly information sheet. There is a list of new overseas standards available in the BSI library.

◆ HOME ◆

Safety Glass

Sir Graham Cunningham, chairman of Triplex Safety Glass Co., Ltd., has stated that his company's exports of laminated safety glass in 1949 were more than 31 times greater than in 1938.

Cellulose Film Prices

The voluntary price control exercised over U.K. manufacturers' prices of cellulose film on the home market has been removed as from January 23. The current prices are only about 11 per cent above those ruling before the war.

Research and Production

The British Welding Research Association will hold an exhibition devoted to "Research and Production" from February 7-11. The exhibition will be open daily from 10 a.m. to 5.30 p.m. at the association's London headquarters, 29 Park Crescent, W.1.

Smokeless Zone Scheme Postponed

Salford's plan to establish three smokeless zones in the city by April and to become one of the first "smokeless cities" in the country, has had to be postponed until after September. The cost of equipment and the problem of providing smokeless fuel are responsible for the postponement.

Gas Explosion

When a gas cylinder exploded at the works of British Cutting Gases, Ltd., Chester Road, Hulme, Manchester, three men were badly burned about the face and hands, and six others—cut off by a wall of flame—escaped over a 15-ft. wall. It is believed that the explosion took place while a cylinder was being filled with propane gas. The firm states that full production was resumed shortly after the accident.

Colloidal Dispersions of Silica

Monsanto Chemicals, Ltd., announces that it has purchased from the National Aluminate Corporation of America its patent rights in the U.K. pertaining to the manufacture of the colloidal dispersions of silica which are sold in the U.S.A. under the trade name Nalcoag. Monsanto has been manufacturing colloidal dispersions of silica in the U.K. for the past two years under the registered trade mark Syton. In acquiring these rights the company will seek to incorporate the results of its own and American experience in the further development of the Syton products.

Coal Production

Britain's deep-mined coal output again fell last week. Production amounted to 4,125,100 tons against 4,174,200 tons in the previous week and 4,231,400 tons in the week ended January 14. Deep-mined output in the same period last year was 4,090,300 tons.

Chemical Company for Sale

Applications for tenders for the purchase of Products Quimicos Gehe, Barcelona, are invited in a recent announcement in the Spanish *Boletin Oficial.* Any United Kingdom inquiries should go to the German Property Section of the Ministry of Foreign Affairs, Ministerio de Asuntos Exteriores, Secion de Bloques, Plaza Provincial 1, Madrid.

Cheaper Streptomycin

Within three months of streptomycin becoming available on prescription, Glaxo Laboratories, Ltd., have announced a price reduction of 1s. to 6s. per vial. This has been made possible by economies in production processes. Glaxo's two northern factories are now producing sufficient streptomycin to supply all requests they receive and leave an export surplus.

Science and Technology

The emphasis laid on academic science as opposed to technological study at the universities was deplored by E. A. C. Chamberlain in a letter to the Press recently. The main need of Scottish industry at present, the writer maintains, is of men who can bring scientific method and discovery to the daily practice of industry. He considered the present system led to reluctance among students to take industrial posts.

New Rayon Association

The newly formed Flat Dyed Rayon Association, Midland Bank Buildings, Spring Gardens, Manchester, has taken over from the Flat Dyed Rayon Group all functions, including technical problems, price, trade conditions, policy and trade contacts. The latter group has stabilised the conditions under which the Flat Dyed Rayon industry is conducted and the new association will concentrate largely on promoting technical efficiency within the industry and stimulating competition under equitable conditions of trading. Mr. William Crossley, chairman of the group, is chairman of the new association and Mr. D. Marshall, manager.

· PERSONAL ·

DR. J. PEARSON has been appointed head of the chemistry department of the British Iron and Steel Research Association in succession to DR. F. D. RICHARDSON (THE CHEMICAL AGE, 62, 138). He has been head of the chemistry section of the BISRA laboratories at Sketty Hall, Swansea, since 1946, where he has worked on the disposal of spent pickle liquor, gas pickling of steel, preparation of replicas for surface finish assessment, etc. Dr. Pearson is a graduate of London University and has previously worked with Tube Investments, Ltd., also with the Armament Research Department of the Ministry of Supply, at Woolwich. He received the degree of Ph.D. in 1946 for research on the polarography of nitro-compounds. In his new post he will be responsible for research on physical chemistry of iron and steel making, refractories and problems of corrosion.

Reed Brothers (Engineering), Ltd., London, announces the appointment of MR. T. F. MCHARDY as manager of its chemical plant section, in place of MR. P. RICHFIELD. In view of Mr. McHardy's experience in the design of chemical plant the firm hopes to be able to extend its facilities offered to customers to manufacture specialised equipment as well as handling modern second-hand plant.

The Liverpool University Chemical Society Medal for 1950 has been awarded to DR. W. H. GARRETT, a director of Monsanto Chemicals, Ltd. It will be presented at the society's meeting on February 23, when Dr. Garrett will deliver the Medal lecture on "The Need for Flexibility in University and Industrial Relations."

THE EARL OF DERBY, M.C., has accepted the presidency of the John Benn Boys' Hostels Association in succession to the late Viscount Leverhulme, and will preside at its annual dinner to be held at the Connaught Rooms on May 17. The Association maintains King George's House, Stockwell, a residential club for homeless boys, of whom more than 1000 have been aided by the association since it was inaugurated in 1927.

The award of the Melchett Medal for 1950 has been made to DR. REGINALD JOSIAH SARJANT, professor of fuel technology at the University of Sheffield.

SIR HENRY DALE left by sea last week for a three months' lecture tour of New Zealand and Canada on behalf of the British Council. He is to lecture mainly to medical and scientific audiences but a number of public lectures have also been arranged. In New Zealand, where he is due to arrive on February 26, he and Lady Dale will be the guests of the New Zealand Government. After touring the principal towns and universities there he expects to fly to Vancouver on April 25. His lecture subjects will include: "Chemical Transmission of the Effects of Nerve Impulses"; "Histamine and the Anti-Histamines"; "The Proper Place of Science in Education"; and "Chemotherapy, its Origin and Current Developments."

The council of the Institute of Fuel announces that MR. JAMES FRANCIS RONCA will succeed DR. D. T. A. TOWNEND as president in October, 1950. Mr. Ronca has served since May, 1945, as the honorary secretary of the institute and was previously a member of council from 1933.

SIR ALEXANDER FLEMING will visit Leeds next month to receive the Addingham Gold Medal awarded for the most valuable discovery in relieving human suffering. The medal is one of three provided for under the will of Mr. William Hoffman Wood, a Leeds architect, who died in 1933.

SIR ERNEST BENN, who is in Oxted Cottage Hospital with a severe attack of bronchitis, is reported to be making slow but steady progress.

Obituary

MR. H. ELIAS BUC, Russian-born organic chemist, who for 24 years was a research chemist for the Standard Oil Development Company, died in his home at Roselle, New Jersey, on January 21, at the age of 69. Mr. Buc went to the United States at the age of 14 and when he died was the holder of 130 petroleum patents.

Institute of Metallurgists' Examinations

Examinations for the licentiateship and associateship of the Institute of Metallurgists will be held from August 28 to September 4. Applications to enter the examinations must be submitted before June 1.

· OVERSEAS ·

Norwegian Drugs a State Monopoly

In his speech at the recent opening of the new Norwegian Parliament, King Haakon announced that proposals would be put forward for the establishment of a State monopoly for, *inter alia*, pharmaceutical supplies, states the bulletin of the Royal Norwegian Information Service in London.

New Tunisian Fertiliser Plant

A superphosphate factory being constructed in Tunisia by the Cie du Sfax-Gafsa is to treat low quality phosphates to produce a superphosphate. It will absorb 500 tons of phosphates daily and should produce just over 300 tons of superphosphates by the end of 1950. A branch of the railway on the Gabes road outside Oued Maou has been constructed to serve it.

French Bauxite Survey

Recent estimates place French bauxite reserves at 15 million tons of aluminium bauxite and 60 million tons of silicous bauxite. The presence of bauxite has been noted in the Massif Central, and in the Madriat region a thick superficial seam up to 25 metres, has been found. Aluminium content rarely exceeds 40 per cent.

Norwegian Nitrogen Record

Norsk Hydro, one of the world's largest producers of nitrogen products, reports that for the first time in its history (since 1905), production last year was in excess of 100,000 tons of nitrogen. At present Norway is among the 10 largest nitrogen producers in the world, and one of the five largest exporters of nitrogenous fertilisers. The expansion programme, now in progress, aims at bringing the company's nitrogen production to 175,000 tons yearly by 1952.

Alleged Alien Property Dispute

The dispute over the final disposition of the holdings of the General Aniline and Film Corporation seized by the U.S. Government as alien property during the war is expected to come up for trial early next month. A claim by the I.G. Chemie of Basle, Switzerland, that it was the former owner of the General Aniline stock and that the stock was improperly seized during the war, was refused by Judge Pine. The Remington-Rand Co. is also involved as claiming that it had a contract with the Swiss firm to buy the General Aniline stock in 1946.

Swiss Geologists for Persia

The Persian Council of Ministers has recently given its approval to a decree which provides for the employment, by the Persian Government, of a group of seven Swiss geologists. The group is headed by Prof. Heim, who has drawn up an oil exploratory programme for those parts of the country in which the Anglo-Iranian Oil Company does not hold concessions.

Indian Protective Tariffs

The Government of India has accepted the Tariff Board's recommendation that the existing protective duties on non-ferrous metals, which are due to expire on March 31, should remain in force until the end of March 1951. The Government has also accepted a recommendation that the duty of 18.75 per cent *ad valorem* on ferro-silicon should be continued up to March 31, 1951.

Pharmaceutical Packings for Sweden

Reports from Sweden indicate a great demand there for every kind of packing material for pharmaceutical products, especially medicine bottles, ointment jars, glass tubes for tablets, etc., all of which were bought chiefly from Germany before the war. Competition by foreign makers is reported to be considerable, and stipulated standards of quality are higher than ever before.

Costly Sulphate of Ammonia

Queensland sugar cane growers are protesting at the high cost of sulphate of ammonia, increased by £2 per ton in the summer and now again raised by £2, making the selling price to users £22 17s. 6d. per ton f.o.r. Brisbane, despite the Federal Government's announcement that a subsidy of £500,000 would be made available for that commodity. The subsidy represents between £6 and £6 10s. per ton.

Plastics Plant in Latin America

First steps towards developing its own plastics industry have been taken in Brazil where two new companies have recently been formed. Vulcan S.A., a subsidiary of the Companhia Nacional de Tejidos Nord Americana has been established in Rio de Janeiro to manufacture polyvinyl chloride sheets. Last July the production of polystyrol plastics was begun by the Bakol S.A. of Sao Paulo. Both concerns are receiving technical advice from the Bakelite Corporation of New York.

Next Week's Events

MONDAY, FEBRUARY 6

The Chemical Society

Oxford: Physical chemical laboratory, 8.15 p.m. (with RIC). Alembic Club lecture. Dr. H. Irving: "Analytical Chemistry: Science or Art?"

Society of Chemical Industry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. F. Armitage: "Recent Developments in the Surface Coating Industry."

British Welding Research Association

London: 29 Park Crescent, W.1, 3 p.m. Sir Ben Lockspeiser (DSIR) opens "Research and Production Exhibition."

TUESDAY, FEBRUARY 7

The Chemical Society

Edinburgh: University Medical Buildings, Teviot Place, 7 p.m. (with Edinburgh University Chemical Society, RIC and SCI). Prof. W. E. Garner: "Some Aspects of Solid Reactions."

Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. W. H. Coates: "The Manufacture of Titanium Pigments."

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. Discussion: "Throwing Power," introduced by G. E. Gardam.

The Institute of Fuel

London: Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. D. Hicks (director, scientific control, National Coal Board): "Scientific Control in the Coal Industry."

Photoelectric Spectrometry Group

London: 47 Belgrave Square, S.W.1, 2.30 p.m. "Stray Light in Relation to Spectrophotometry," introduced by Dr. J. E. Edisbury (Research Department, Lever Bros. and Unilever, Ltd.). Followed by meeting of the Industrial Spectroscopy Group, 6 p.m. Dr. A. C. Menzies (Hilger and Watts, Ltd.) "Spectroscopy in the United States."

WEDNESDAY, FEBRUARY 8

The Chemical Society

Northern Ireland: Belfast, Queen's Hotel, 7.30 p.m. (with RIC, SCI and Society of Dyers and Colourists). E. F. Eaton: "Colours in Food."

Society of Chemical Industry

Dublin: Trinity College, 7.45 p.m. T. Bratt: "Scientific Control in the Transport Industry."

THURSDAY, FEBRUARY 9

The Chemical Society

Bristol: University, 7 p.m. (with RIC and SCI). Prof. M. Stacey: "Studies of Some Organic Fluorine Compounds."

Hull: University College, 6 p.m. (with Hull University College Scientific Society). Dr. H. W. Thompson: "Some Recent Applications of Infra-red Spectroscopy."

The Royal Institute of Chemistry

London: Acton Technical College, High Street, W.3, 7.30 p.m. E. Lester Smith: "Vitamin B_{12}."

Institute of Metals

London: 4 Grosvenor Gardens, S.W.1, 7 p.m. E. J. Vaughan: "Recent Developments and Modern Techniques in Metallurgical Analysis."

Pharmaceutical Society

Manchester: Houldsworth Hall, 7.45 p.m. A. F. Plowman (assistant secretary): "Pharmaceutical Education with a Special Reference to Recent Changes."

Fertiliser Society

London: 26 Portland Place, W.1, 2.30 p.m. R. A. Hamilton: "The Role of Fertilisers in Increasing the Output from Grassland."

FRIDAY, FEBRUARY 10

The Chemical Society

Birmingham: University, Edgbaston, 4.30 p.m. Sir Ian Heilbron: "Fifty Years of Organic Chemistry."

South Wales: Swansea, University College, 5.30 p.m. (with RIC and University College of Swansea Students' Chemical Society). Prof. W. Wardlaw: "Some Problems in Inorganic Chemistry."

Society of Chemical Industry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 7 p.m. (Fine Chemicals Group.) J. Davidson Pratt (ABCM): "The Economics of the Fine Chemical Industry."

Oil and Colour Chemists' Association

Manchester: Engineers' Club, Albert Square, 2 p.m. N. D. P. Smith: "The Use of the Electron Microscope in Paint Problems."

Institution of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.45 p.m. (with Plastics Institute). Maldwyn Jones: "Polythene."

SATURDAY, FEBRUARY 11

Institution of Chemical Engineers

Birmingham: University, Edmund Street, 3 p.m. R. Scott: "Modern Pipe Still Design."

The Stock and Chemical Markets

A MINOR reaction in British Funds made for easier conditions on the Stock Exchange earlier in the week, leading industrials easing with Gilt-edged, although there was very little selling. General Election uncertainties kept business in check in the industrial sections, and in the main movements have not exceeded more than a few pence.

Caution is evident because of indications that many industries are facing growing competition at home and abroad and it is therefore thought that it will be increasingly difficult for companies to maintain net profits. It is, nevertheless, confidently expected that it will be possible to keep the dividends of leading industrials at last year's rates.

As was to be expected, shares of chemical and kindred companies have moved with the prevailing trend. Imperial Chemical, after improving to 41s. 9d., came back to 41s. 3d., at which there is a yield of nearly 4⅞ per cent, and there is general confidence that the 10 per cent dividend will be maintained. A factor which influences the shares is the market assumption that owing to the progressive policy of the group, further capital will be required by I.C.I. in due course, although no early development of this kind is expected. The City believes that if and when more capital is required, shareholders are likely to be given preferential terms of allotment.

Albright & Wilson 5s. ordinary shares remained steady at 29s., being unaffected by market rumours that the company may be contemplating a £1 million issue of 4½ per cent preference shares. Fisons at 26s. 9d. have been steady in the results; the chairman tells shareholders in his annual statement that the raising of additional loan capital to finance commitments, and provide for financing stocks when the fertiliser subsidy ends, is being discussed by the directors.

Brotherton 10s. shares have remained at 19s. 3d., Monsanto were 50s. 9d., Boake Roberts 25s. 6d., and Amber Chemical 2s. shares at 4s. 9d., with F. W. Berk at 14s. 3d., and Bowman Chemical 4s. shares 5s. 3d. L. B. Holliday 4½ per cent preference kept at 19s. 9d., and British Chemicals & Biologicals 4 per cent preference at 18s. 3d. Pest Control 5s. shares were 8s., and Laporte Chemicals 5s. ordinary changed hands around 9s. 6d.

British Glues & Chemicals 4s. shares further strengthened to 19s. 9d. Activity in United Molasses up to 40s. 9d. was attributed to revived talk of share bonus possibilities. Turner & Newall have been firm at 78s. 3d., but Borax Consolidated eased further to 55s. 3d. The 4s. units of the Distillers Co. have been firmer at 17s. 6d. Owing to Continental selling, Lever N.V. fell to 41s., and Lever & Unilever were also lower at 40s. 3d. Associated Cement were 74s. 3d.

Boots Drug were steadier at 47s. 6d. Triplex Glass at 18s. were unaffected by news of further growth in the company's export business. British Aluminium have been firmer at 40s., with British Oxygen 91s., and United Glass Bottle 68s. 9d. Glaxo Laboratories rallied to 43s. 3d.

Market Reports

A STEADY demand continues in most sections of the industrial chemicals market and firm price conditions prevail generally. A good inquiry for export has been reported and actual bookings for Commonwealth destinations continue to be satisfactory. An active request persists for most of the soda products, with caustic soda and bicarbonate of soda moving particularly well. Firmness characterises the position of the potash chemicals. Hydrogen peroxide and formaldehyde remain in good call while the barium compounds, bleaching powder and borax are other items attracting a fair amount of attention. Business on the coal tar products market is again without feature. An active buying interest in the xylols, benzols and toluols has been reported and naphthalene offers find a ready outlet with quotations for the crude qualities a little dearer.

MANCHESTER.—New inquiry and actual business on home trade account has been of fair extent on the Manchester chemical market and a satisfactory feature is that leading industrial consumers continue to press for deliveries against contracts of good quantities of a wide range of light and heavy products. Shipping business locally has remained at around the level of recent weeks. Little change on balance in the general price position has to be noted.

GLASGOW.—There has been a gradual improvement in general business in the Scottish heavy chemicals market during the past week. Export business also continues on the up grade.

SHALE OIL CENTENARY

Origins of Scottish Industry

THE Second Oil Shale and Cannel Coal Conference which the Institute of Petroleum will stage in Glasgow from July 3 to 7 is fortunately placed in time and situation since 1950 marks the centenary of the James Young Patent which brought into being the Scottish shale oil industry. It is, moreover, staged at a time when Scottish Oils, Ltd., the direct descendant of the original project, is engaged in a major expansion of its activities.

Present day developments will be demonstrated by Scottish Oils, which is to act as host to oil men from all over the world, as joint organisers of the conference, with the Institute of Petroleum.

Eye-witness' Account

Less familiar facts about the origins and early expansion of the industry—writes a Scottish correspondent—are preserved in "The Industries of Scotland" written by David Bremner around 1869 and published by Adam and Charles Black in Edinburgh. It gives an interesting eye-witness picture of some of the events in the growth of a major Scottish industry.

Prof. Lyon Playfair, Bremner reports, first saw oil bearing shale at Alfreton in Derbyshire in 1847 and interested James Young, then a chemist in Manchester. A successful plant was established after his first experiments proved the commercial value of the product; this stopped when the raw material was exhausted and was followed by two years of intensive research into the nature of the raw material, its cause and the location of a further source. Coal from Boghead, near Bathgate in Midlothian, tested in 1850, proved to be particularly rich in oil. A patent was taken out for "treating bituminous coal to obtain paraffin and oil containing paraffin" and a site selected near Bathgate. Mr. Young had meantime been joined by a Mr. Meldrum and a Mr. Binney, the former supervising the erection and management of the plant which was erected.

Several companies began work before the expiry of the original patent in 1864, all located in or near the area chosen by Young, who had established Young's Paraffin Light and Mineral Oil Co. (Ltd.), about 1866, and was managing both the Bathgate Chemical Works—his original venture—and the new works.

At that time Addiewell was contemplating the lighting of the village with gas from Addiewell. The plant was then producing 1¼ million cu. ft. of gas much of which was surplus to the needs of the plant. An offer was made to Edinburgh to supply gas at a cost of 1s. 6d. per 1000 cu. ft. Bremner, however, does not record whether the City considered the proposal. By this time five locomotives were in use shuttling shale to the works and the number of employees had reached over 1000, 400 of whom were miners. A vast amount of work was being given by the other companies in the area and throughout Scotland and England, in the distribution of Bathgate and Addiewell products. Young was then providing for his workers houses, schools and other community facilities.

Bremner claims "Mr. Young's little factory at Alfreton was the parent not only of the Scotch mineral oil trade but also of that of America; for until he began operations, oil had never been distilled to produce an article of commerce."

(*continued at foot of next column*)

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

ARLEE, LTD., Ashtead, chemical manufacturers, etc.—December 29, £500 deb. to Mrs. M. Tuckman, London; general charge. *——. September 27, 1948.

New Registrations

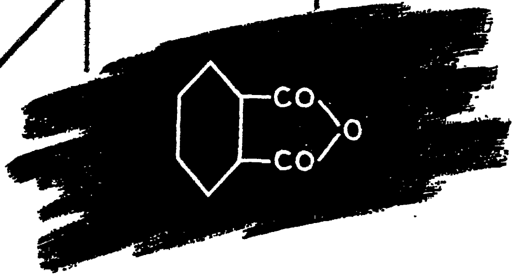
Bollin Chemicals, Ltd.

Private company. (477,503). Capital £1000. Chemical and physical industrial scientific consultants, analysts, assayers, etc. Directors: E. M. Meade and B. M. Meade. Reg. office: 395 Corn Exchange Buildings, 27 Fennel Street, Manchester.

Changes of Name

The following changes of name have been announced: KINGSTON PACKING CO., LTD., to J. Peters (Bridlington), Ltd.; RADI CHEMICALS, LTD., to Radiol Chemicals, Ltd.; SUPER PRODUCTS, LTD., to F. R. Cullingford, Ltd.

PHTHALIC ANHYDRIDE FLAKES



Phthalic Anhydride is one of two hundred chemicals made by Monsanto and used throughout the field of industry. While the overall production position is a little easier, demand still exceeds supply in many instances

Please write to the Sales Department, indicating the industries in which you are interested, and asking for descriptive leaflets, with notes on current availability

MONSANTO CHEMICALS LIMITED, VICTORIA STATION HOUSE, LONDON, S.W.1

Fostering India's Plastics Industry

Tariff Protection, Research and Development

THE close relationship of the plastics industry with basic chemicals and the importance of its development in the national interest were some of the main recommendations of the Tariff Board, in recognition of which the Government of India has decided to grant the industry protection until March 31, 1953.

The existing revenue duty of 30 per cent *ad valorem* on phenol-formaldehyde moulding powder will be converted into a protective duty, while manufacturers with a minimum annual production of 200 tons of moulding powder will be granted a refund of import duty on the three principal raw materials used—phenol, formaldehyde and hexamine.

Government's View

With regard to the recommendation for the reduction of duty from 30 to 20 per cent *ad valorem* on ureas, formaldehyde moulding powder, polystyrene, cellulose acetate, nitrate and butyrate, polyvinyl chloride, casein, resins (other than phenol-formaldehyde resin) sheets, rods and tubes, the Government of India considered that requirements could be adequately met by restricting the reduction in duty to cellulose nitrate (sheets, rods and tubes) rennet casein and polyvinyl chloride resin.

Raw celluloid, imports of which were formerly free for the manufacture of combs and subject to a 30 per cent duty for other uses, will now be subject to a uniform duty of 20 per cent.

Existing revenue duty on electrical accessories will be converted into a protective duty, the preferential rate of 24 per cent in the case of imports from the U.K. being raised to 30 per cent and the standard rate adjusted in accordance with the terms of the Indo-British trade agreement of 1939.

Finishing sections of the industry have developed more quickly than those supplying the basic and intermediate raw materials, so that the plastics industry is at present almost entirely dependent on imported raw materials, moulds and machinery.

Various schemes of research connected with indigenous plastic materials are being carried out and it is hoped by the board that these and the establishment of a larger unit for the manufacture of moulding powders will eventually supply the required raw materials.

The plastics industry, in the view of the Tariff Board, must co-operate in schemes of research by setting aside funds for pilot plant experiments to help the introduction of new processes and materials. Early steps should be taken to formulate and enforce proper standards, both for moulding powder and finished articles.

Salt in India

THE Central Salt Advisory Committee of the Government of India has recommended that there shall be no further import of salt into the country this year. It suggests that the 1949 production of 63.5 million maunds should be increased to 70 million maunds in order to make India self-sufficient in salt. The Government is expected to accept this recommendation, which, it is believed, would save the country over Rs.7 million annually. Production in 1949 was about 15 per cent above that of the previous year.

BURGESS ZEOLITE COMPANY LIMITED
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The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4
Telegrams: ALLANGAS FLEET LONDON · *Telephone:* CENTRAL 3212 (20 lines)

Volume LXII 11 February 1950 Number 1596

Science Themes at the Festival

WHEN it was announced, during the latter half of 1949, that a large part of the country's resources—of intellect, constructive capacity and money—would be preoccupied with creating a modern counterpart of the Great Exhibition of a century before, one of the common reactions was incredulity. The advisability of holding a Festival of Britain at a time less appropriate to festivity than to hard work is still open to doubt; but, since there is no longer anything tentative about the proposals, it is satisfactory to know that the plans formulated so far are of a kind to ensure that the 1951 Exhibition will be a really expert presentation of some characteristic quality and achievement which we need have no diffidence in publicising.

That assurance can be taken from the first fairly detailed account which has now been offered by the Festival authorities, of the organisations expected to collaborate and the character and scope of the exhibitions, which will occupy not only the Thames-side sites but also the Science Museum in South Kensington, the Kelvin Hall, Glasgow, an aircraft carrier and a mobile road assembly. All those locations, it is evident, will be barely sufficient to house comfortably even the review of scientific achievement which, in recognition of the current public taste for having abstruse things made comprehensible, is evidently going to predominate in the impressions which the Festival will convey.

The 1951 Exhibition has, of course, very much wider terms of reference. It is to celebrate also British achievements in the arts, science, technology and industrial design, but that does not dismiss the current evidence that science and technology, perhaps because they are thought to be more apt for tangible presentation, are to afford the memorable themes. The ambitiousness of such an undertaking would give rise to doubt whether any individual body—in this instance the Council of Science and Technology—would be capable of handling it adequately. The council, however, is fortunately a body of experts and will be guided by no less than 16 specialist panels, every member of which is an authority in one or other department of science. The reputations of many who have been mentioned as intimate collaborators render it highly unlikely that the displays will fail to present a fully balanced picture of the real

On Other Pages

Leader:

Science Themes at the Festival . . 213

Notes and Comments:

North-Western Engineers . . 215
Welding Aids to Production . . 215
Canada's Water Power . . 215
Neutron Treatment of Diamonds 216
I.C.I. as Publisher . . 216
Fertiliser Research Association . . 217
World Food Problems . . 217
Sulphuric Acid Statistics . . 218
Growth and Prospects of Chemical Industries . . 219
Gelatine and Glue Research . . 222
Technology and Production (N.-W. Chemical Engineers) . . 223
Monsanto Companies Join Forces in India . . 223
Government Scientists . . 224
District Heating . . 224
Power from Peat . . 224
New Automatic Fraction Collector 225
Anodic Oxidation Standard . . 225
Plastics Uses of Diallyl Phthalate . . 226
Modified Analytical Instruments . . 227
Present Trends in Baking Research 229
Difficult Moisture Determinations . . 231
Italy's Native Activated Alumina . . 231
Increasing the Hardness of Diamonds 232
Tests with Radioactive Insecticide . . 235
French Leather Research . . 235
Mexican State Drugs . . 235
Comparative Progress in Germany . . 237
Acid Plant for Athens . . 242
Laboratory Glassware . . 242

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values of British research workers' achievement.

Notwithstanding the dramatic possibilities of many of the stories which go to make up the main narrative of British scientific achievement, even in the relatively fleeting period since sciences were conscripted for war purposes, the science and technology council will have one of the hardest selection tasks of any. The intention is that each theme shall be portrayed, pictorially or by physical examples, in a way which will make evident to all the main steps in the investigational or development work and the fruits which they have borne in civilised affairs. Because one of the problems of such an exhibition is to keep steady the flow of visitors passing through, captions and printed explanations are to be kept to the minimum. Graphs and comparatively elaborate diagrams will presumably come under the same ban, so that the task of giving adequate exposition even of such a subject as the use of radioactive "tracer" materials would call for the combined qualities of scientist and publicist. There are fortunately among the leading figures in contemporary chemistry and physics several who have shown a quite exceptional ability to reduce the remote and the abstract to comprehensible human terms, without concealing the essential qualities, and most of them are known to be helping to prepare next year's show.

While the prime aim of any expositions of this kind must be to make themselves intelligible to all and sundry, it would be surprising if a festival on this scale did not attract numbers who look for a more advanced representation of subjects of which they already know the rudiments. It was presumably with them in mind that the planners of the exhibition provided for the inclusion, at South Kensington, of an integrated presentation of one theme fundamental to much of the progress recorded elsewhere, the steps by which the nature and architecture of matter are being revealed. The plan here—as described by Sir Edward Appleton—will be to lead the visitor by easy stages to view the inwardness of relatively familiar solids, liquids and gases as they are translated into their molecular and atomic components, and so to the fundamental particles of the atom and finally to the inner structure of the nucleus itself. Here the model and advanced camera techniques will evidently be the only practicable way of making the story comprehensible.

Notes and Comments

North Western Engineers

THE continued predominance of the North-West as a spiritual and traditional homeland of chemical engineers was attested at the meetings in Manchester on February 3 of the virile North-Western branch—" the branch "—of the Institution of Chemical Engineers. The attendance from places as distant as London of people who are helping to make chemical engineering history and of Sir Wallace Akers, to give a new perspective of the chemical engineers' next responsibility—atomic energy—testified to the undiminshed influence of the Manchester school. It is, however, characteristic of chemical engineers not to meet merely for the purposes of mutual admiration. In that tradition was the pointed reminder given at the annual dinner by the national president (Dr. D. M. Newitt) that Manchester's fine record of education in technology displayed one surprising omission. Manchester still lacks a university Chair in Chemical Engineering.

Welding Aids to Production

THE timely " Research and Production " exhibition, staged by the British Welding Research Association at its London headquarters this week, well illustrated the importance of modern welding processes in the engineering industries generally and in chemical engineering in particular. That the association is keeping abreast of the growing demands for technological guidance from industry and adapting its research to all the "new" metals, was acknowledged by Sir Ben Lockspeiser, secretary of the DSIR and himself an engineer, who performed the official opening of the exhibition. He foresaw the increasing closeness of the links between the securing of export markets and the work of such associations as the BWRA. He was quite sure that the money spent and being spent on welding research would be returned to industry many times over. Industry's contribution to the association's funds had enabled it to spend on profitable research in 1949 something like £50,000. The DSIR contribution to the same end matches whatever is subscribed by industry. Meanwhile, industries were asking for researches in welding subjects which would almost double the present annual expenditure of the BWRA. He gave his assurance that the DSIR would not stint its support, even to that amount, " if industry showed willing."

Canada's Water Power

THE rapidly changing character of Canada, which some are still tempted to picture in the context of grain lands, prairies and forests, seems to be the subject of nearly all the news from the Dominion. The effect of them all is to present a story of development of industry and resources having its only close counterpart in the U.S.A. Dependent on no one for its food, and with great power sources—native petroleum and electricity—continually yielding new energy and promising much more, Canada's future as a great industrial nation cannot be in much doubt. The all-important contribution to the growing industrial character is, of course, Canada's rapidly increasing hydro-electric capacity, which now totals more than 11.6 million h.p., and the existence of vast untapped reservoirs of power. Developments in an advanced stage of construction are expected to add, within the next two years, 1.5 million h.p. and there are long-range plans for the exploitation of other great sources of water power. These figures, reported by the Canadian Department of Mines and Resources, are more than justified by the great demand for primary power, which last year increased by a further 3 per cent. Aluminium production, dependent on the harnessing of vast hydro-electric energy, will benefit greatly by the development of these plans. The Aluminium Company of Canada is carrying out its own investigations to establish soon a large high-head plant on a coastal inlet. To do this it may divert water from the headwaters of the Fraser River by a tunnel through the Coast Range. The chemical and allied industries, as well as food production, increasingly dependent on electrical and electrolytic processes, will undoubtedly receive an important stimulus from this work to make full use of the same natural gift, here of gigantic proportions, upon which was founded most of Italy's earlier importance in chemistry and metallurgy.

Neutron Treatment of Diamonds

THE patent described elsewhere in this issue relating to neutron treatment of diamonds and other gems, primarily to change their colour (and their value) is of great theoretical interest because of the suggested likelihood that properties other than colour can be modified. While numerous attempts have been made to synthesise the diamond and to increase its hardness, no economically feasible process has yet been evolved since the time when R. H. Marsden and Moisson made their classical attempts. It is probable, however, that true diamonds of synthetic origin are to-day somewhat nearer realisation than formerly, owing to the great advance made in the production and use of extremely high pressures and temperatures. Professor Nahmias, in his specification, mentions the possibility that certain impurities may act as catalysts in the conversion of graphite to diamond, thus evoking the prospect of catalytic action effecting purely physical changes, as distinct from the well known chemical effects. The subject matter appears to lie mainly in the realm of theoretical possibilities, and these are generally not patentable. The comment of diamond experts is that until further experimental investigation is undertaken it is difficult to determine the practical possibilities of this patent, although there is no doubt at all about the purely scientific and theoretical interest. The fact that the patent process requires the use of an atomic pile obviously greatly diminishes practical commercial interest; but, viewed as an adjunct to the extremely wide possibilities of effecting vital changes of materials by neutron bombardment, the theme seems to deserve close attention.

I.C.I. as Publisher

REFERENCES to I.C.I., Ltd., as "the great chemical combine," or sometimes "colossus"—with equal alliterative effect—have been common during the current political spate. It seems to occur to no one to identify I.C.I. as a great publishing undertaking, which in fact it is. The evidence of that was shown last year in an exhibition which, held primarily for its own staff, nevertheless aroused a good deal of public interest. (THE CHEMICAL AGE, *60*, 879.) A larger and more popular form of display of I.C.I's technical literature is to be held in London at the Academy Cinema Exhibition Hall, Oxford Street, from March 6-17. The sharing of results of research and scientific knowledge will be shown by publication of papers delivered by experts to various associations, while the production of literature describing a recent discovery will be traced from the scientist's laboratory notebook to the printing press. I.C.I. publishes new technical literature at the rate of two publications a day, or 800 a year, and from two to four million copies are printed annually. Some will regret that some examples of the company's publicity series such as "Ancestors of Industry"—which brought a new quality to advertising—cannot be included. They may not be "technical literature" but their value as popular enlightenment is not in doubt.

Industrial Finishes Exhibition

THE first British Industrial Finishes Exhibition will be held in London at Earls Court from August 30-September 7. Sir Edward Appleton, principal and vice-chancellor, Edinburgh University, is a member of the honorary council.

FERTILISER RESEARCH ASSOCIATION

Initial Group's Appeal for Support

THE decision to proceed with the formation of a co-operative research group for the fertiliser industry is confirmed by the circulation, last week, of articles of association of the Fertiliser Research Association, to be formed as a company limited by guarantee.

Nearly a year has elapsed since the proposal to form such a research body was made public (The Chemical Age, *60*, 497). Since then the scope of activities originally proposed has been broadened to cover " all fertilisers," and not merely phosphate and compound fertilisers.

This policy seems to have been influenced by the conditions associated with receipt of a Government grant, such as is awarded to a number of other research associations. The grant will be received through the Department of Scientific and Industrial Research, whose assistance in preparing the draft rules, etc., is acknowledged in a very informative prospectus which is being circulated to potential members. This mentions that I.C.I., Ltd., and Fisons, Ltd., are not intending at this stage, to become members.

Charge on Tonnage

The Formation Committee observes, in this context, that:—" Provided other prospective members, who provisionally offered to support it are still prepared to do so, the committee considered that a basic subscription plus the flat rate subscription of 3d. per ton will raise an adequate sum, together with the DSIR grant to enable useful work to be started."

The basic annual subscription is likely to be £50, which members will have to contract to pay for at least five years. Members joining three months after the association has been formed will be required to pay an entrance fee also.

The committee foresees the possibility that, as subscriptions are to be on a tonnage basis, it may be possible for the subscription of an individual member to drop below his guaranteed minimum if the overall tonnage of subscribing members has increased.

The committee's appeal for support from other fertiliser manufacturers emphasises the need for " new and possibly major technical developments," and expresses the view that, individual research undertakings are unlikely to be large enough to solve some of the industry's fundamental problems.

" What is urgently required," says the appeal, " is a powerful joint attack upon problems of raw material supplies and of manufacturing final products that are more effective in the soil. This is likely to be long-term research and for that reason it should start as soon as possible. In addition there are immediate problems in the study of many little understood factors which influence present manufacturing methods."

First Members

It is indicated that the programme will include fundamental research, as well as technical and process problems and the study of new methods suggested by research in other parts of the world and the advances made by allied organisations, such as the Agricultural Research Council.

The Formation Committee's manifesto is signed by the following:—

J. Angus (Scottish Agricultural Industries, Ltd.), C. H. J. Corbett (Edward Webb & Sons (Stourbridge), Ltd.), W. B. Davies (Lawes Chemical Co., Ltd.), D. P. Hopkins (H. & T. Proctor, Ltd.), E. P. Hudson (Scottish Agricultural Industries, Ltd.), G. F. New (general manager and secretary, Fertiliser Manufacturers' Association), J. T. Proctor (Hy. Richardson & Co. Ltd.), J. W. Parkes (W. & H. M. Goulding, Ltd.), E. M. Reid (Richardsons Chemical Manure Co., Ltd.), A. T. Vernon (Cannock Agricultural Co. Ltd.).

World Food Problems

THE greatly heightened attention being paid to fuller production and distribution of the world's food can be largely attributed to the untiring efforts of Lord Boyd Orr, who will preside at a conference in London on March 4 and 5, on " The World's Food and Britain's Needs."

The conference is being organised by the Association of Scientific Workers, and a number of prominent scientists will take part in the discussions. Dr. Julian Huxley will deal with the population question; Sir R. George Stapledon with means to enable Britain to meet the needs of her own people.

" Food From Waste Materials," will be the subject of a talk by Mr. Ritchie Calder who has recently returned from studying desert reclamation in North Africa. A final survey of the evidence provided by the conference will be made by Mr. F. le Gros Clark.

Sulphuric Acid Statistics

U.K. Production and Consumption in Last Quarter

THE classified summary below of the figures for the quarter ended December 31, 1949, issued by the National Sulphuric Acid Association, Ld., reveals that there was an increase in production and consumption in the United Kingdom of sulphuric acid and oleum compared with the July-September period. Comparative figures were: Production: 435,190 tons, against 402,926 tons in July-September. Consumption: 442,948 tons, compared with 399,850 tons in July-September. Noteworthy increases in consumption of individual items in the last quarter, compared with the third three-months' period were:—Dyestuffs and Intermediates 18,816 tons against 15,738 tons: hydrochloric acid 16,363 tons (15,133); iron pickling 24,468 tons (22,175); oil refining and petroleum products 13,906 tons (11,108); paint and lithopone 30.860 tons (18,836); rayon and transparent paper 51,978 tons (40,116). Sulphate of ammonia showed a slight decrease in consumption, with 63,815 tons (64,682), as also did superphosphates 121,545 tons (126,643).

Total production in the United Kingdom of sulphuric acid and oleum for the full year 1949 was 1,791,740 tons, compared with 1,601,438 tons in 1948 for the United Kingdom and Eire combined. Total consumption in the U.K. during 1949 was also up on the 1948 figure for the U.K. and Eire combined, with 1,677,509 tons (1,613,208).

PRODUCTION OF SULPHURIC ACID AND OLEUM

(Tons of 100% H_2SO_4)

	Chamber only	Contact only	Chamber and Contact
Stock, Oct. 1., 1949 ...	31,252	35,873	67,125
Production	184,887	250,303	435,190
Receipts	49.938	12,224	62,162
Oleum feed	—	2,681	2,681
Adjustments	—67	—19	—86
Use	110,166	97,423	207,589
Despatches	122,131	171,935	294,066
Stock Dec. 31, 1949 ...	33,713	31,704	65,417
Total capacity represented	199,930	264,240	464,170
Percentage production...	92.5%	94.7%	93.8%

RAW MATERIALS

(Tons)

	Pyrites	Spent Oxide	Sulphur & H_2S	Zinc Concentrates	Anhydrite
Stock Oct. 1, 1949	70,676	173,778	78,101	45,622	750
Receipts ...	41,149	61,327	71,865	37,588	42,472
Adjustments	+299	+558	—248	—94	—
Use ...	58,353	48,961	81,937	43,856	42,512
Despatches	134	7,278 147†	32	10	—
Stock Dec. 31, 1949	53,637	179,277	67,749	39,250	710

† Used at works for purposes other than sulphuric acid manufacture.

CONSUMPTION OF SULPHURIC ACID AND OLEUM
UNITED KINGDOM

	Tons 100% H_2SO_4
Accumulators	2,668
Agricultural purposes	726
Bichromate and chromic acid	3,117
Borax and boracic acid (" unclassified ") ...	
Bromine	2,917
Chlorsulphonic acid (" unclassified ")	
Clays (fuller's earth, etc.)	2,687
Copper pickling	719
Dealers	4,724
Drugs and fine chemicals	2,735
Dyestuffs and intermediates	18,816
Explosives	3,290
Export	1,010
Formic Acid (" unclassified ")	
Glue, gelatin and size	41
Hydrochloric acid	16,363
Hydrofluoric acid	2,254
Iron pickling (incl. tin plate)	24,468
Leather	1,734
Metal extraction	430
Oil refining and petroleum products	13,906
Oils (vegetable)	2,694
Oxalic, tartaric and citric acids (" Unclassified")	
Paint and lithopone	30,860
Paper, etc.	891
Phosphates (industrial)	1,618
Plastics, not otherwise classified	5,450
Rare earths (" unclassified ")	
Rayon and transparent paper	51,978
Sewage	2,819
Soap and glycerine	2,920
Sugar refining	184
Sulphate of alumina (" unclassified ") ...	
Sulphate of amonia	63,815
Sulphate of barium	1,146
Sulphate of copper	5,353
Sulphate of magnesium	1,617
Sulphate of zinc	883
Superphosphates	121,545
Tar and benzol	4,397
Textile uses	6,298
Unclassified: Uses known	24,194
Uses unknown	11,681
TOTAL	442,948

Fewer Dollars for Oil Plant

ECA funds for expansion of the Shell Haven oil refinery at Stanford-le-Hope, Essex, have been reduced by $7,588,000 (about £2.7 million), three-quarters of the sum originally proposed. The ECA stated that this had been done at the request of Britain. The revised plans will reduce the potential distillation capacity to 40,000 barrels a day and dispense with the catalytic cracker.

THE GROWTH OF CHEMICAL INDUSTRIES

Some Deterrent Effects of Government Controls

AT the end of the war the chemical industry was faced with three main tasks, states the ABCM's "Report on Chemical Industry, 1949."* First it had to deal with arrears of maintenance of plant and services and so to maintain existing plant in full production. Next came the task of erecting new plants or extending existing ones in order: (a) to provide other industries with the chemicals needed to meet essential home requirements and to increase their export of finished and semi-finished goods; (b) to increase direct export of chemicals for re-establishment of industry in other countries and generally to bring in foreign currency. The third task was to exploit discoveries or inventions ripe for development at the outbreak of hostilities and those made during the war.

The principal factor retarding speed of progress in any one project has probably been the operation of controls involving several Ministries—states the report. The nation's limited resources in manpower and constructional materials make inevitable a measure of Government supervision over schemes of industrial development, and the industry willingly responded to the Government's appeal, in the autumn of 1947, for restraint in capital expenditure.

All the same, it is held that in considering the schemes submitted there was not adequate appreciation either of the basic nature of the industry and its importance to other industries or of the time that must necessarily intervene between the issue of licences and the completion of projects.

Replacements Overdue

The report expresses the hope that plans are well advanced for eliminating all controls and permit systems no longer essential.

Schemes for the replacement of existing plant because it is in a bad physical condition or is uneconomic have often had to be postponed. There is a limit to the extent to which a chemical manufacturer can "make do and mend," particularly because many plants were perforce allowed during the war to fall behind the stage of efficient maintenance. Moreover, the longer repairs are deferred, the greater the damage to be made good.

Persistent lack of attention to major repair work must lead to serious curtailment of production and also to increased industrial hazards. The importance of adequate maintenance facilities appears not always to be appreciated by Government departments, and several schemes for improving maintenance workshops have been rejected.

Many schemes for increasing research and development facilities have been deferred by the Government, even when they have a direct bearing on increasing the efficiency of existing processes. Equally, if not more, serious is the long-term effect on new research and development.

Impediments

Time lost on research may never be regained; the industry has already a considerable leeway to make up compared with the American manufacturer, who has suffered much less from difficulties, delays and frustrations than British industry, both during and since the war.

Government departments have discouraged the provision of additional office accommodation and amenities, even when these are essential to additional staff and workpeople for the design, building, operation and control of increased production, and even when the existing facilities have been condemned by H.M. Factory Inspectors. After the war until early in 1948 structural steel authorisations were totally inadequate and apparently unrelated to requirements for approved and licensed schemes. The position has improved of late, but it would be a further help to industry if steel allocations could be made earlier than at present.

The report deals at length with the subject of plant and equipment. It notes that, although no direct control has been exercised on schemes involving only plant and equipment, delays have occurred for two reasons. In the first place, many engineering contractors receive bulk authorisations for steel needed for fabrication of their normal products; much chemical plant falls outside this category and chemical manufacturers have therefore had to obtain a supplementary authorisation to be re-allocated to the engineering contractors. This has led to serious delay in delivery of equipment, inevitable while the present system of allocation continues.

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*The Association of British Chemical Manufacturers' report was reviewed in part last week (62, 183-188).

Owing to the corrosive nature of some chemical products, stainless steel is often essential for the construction of plant. Great shortages have occurred in the past and it is not known whether adequate supplies will be available in future. Priority should be given to those uses of stainless steel to which there are no practical alternatives.

Equipment Withheld

In the second place, serious delays also arise because the engineering industries, which include the manufacturers of chemical plant, were given large export targets by the Government immediately after the war; as a consequence equipment badly needed in the United Kingdom has gone to overseas competitors. The industry was thus denied plant required for its own rehabilitation and development and to capture markets abroad, while firms in those countries have been able to set up manufacture, thus automatically curtailing our possible exports.

As chemical plant may easily produce several times its own value in a year, the wisdom of the above policy can be legimately questioned. The position was improved by the Government's instructions given in the late autumn of 1947, the full effect of which has not yet been felt because of the export commitments of the plant manufacturers.

While the general position is better, delivery dates of one or two years ahead are still common. The absence of some small but essential part has sometimes kept idle for months important new plant for producing a badly needed product.

The ABCM appreciates the co-operation received from the British Chemical Plant Manufacturers' Association, the Ministry of Supply and the Board of Trade in its attempts to deal with serious delays.

It was at one time hoped to mitigate the difficulties due to slow delivery of plant by the reparations scheme on which the industry spent much time and money, sending many expert teams of inspection to Germany; it expected to solve some of its equipment problems, if only on a temporary basis, by the use of such plant. In fact, very little has become available, and in consequence several manufacturers have been badly handicapped and time and money have been wasted.

The chemical industry is well aware of this country's critical dollar shortage. It is therefore the more appreciative of the Government's action in permitting purchase from the U.S.A. of essential chemical plant that could not be obtained elsewhere. It must be emphasised that in many instances these purchases will themselves effect much more than an equivalent dollar-saving by making it possible to produce here vital chemicals hitherto to be bought only in dollar areas.

Summarising some of the principal factors in raw material supplies, in their relation to the progress of development, the report reflects the uncertainty regarding sulphur-containing materials, more particularly of spent oxide, dependent upon the operations of the gas industry.

In 1938 about 75,000 tons of sulphur were used for the manufacture of sulphuric acid. By the end of 1949 this rate of consumption will have risen to some 340,000 tons per annum. This increase, the report observes, is due mainly to war-time factors —political, strategic and economic—which led the Government from 1940 onwards to erect sulphur-burning plants on their own behalf and to support the erection of others by the industry.

Material Supplies

Information obtained from the industry by the ABCM shows that generally no special supply difficulties are expected over additional requirements for most other raw materials. Anxiety has, however, been expressed about the following:—

(1) Borax, because of the dollar shortage; (2) Cadmium metal; (3) Certain coal tar products, such as anthracene, naphthalene, meta-xylene and meta-xylenol; (4) Hard coke for the production of ammonia and methyl alcohol; (5) High acetyl cellulose acetate for X-ray film base; (6) Monazite sand, required for the manufacture of cerium and thorium compounds; (7) Naphthenic and stearic acids; (8) Palm kernel oil for the production of long chain alcohols; (9) Pig lead; (10) Tobacco offal for nicotine production.

The present shortage of packaging materials often results in inferior packing and consequent damage to goods in transit. Apart from the losses involved, both these defects have a bad psychological effect on the customer.

The report stresses the essential character of adequate supplies of fuel of the right quality at the right price. Power cuts had peculiarly unfortunate results for the chemical industry. They increase industrial hazards and may introduce new ones; they may cause extensive loss of raw materials and labour, with consequent effects on production, because chemical processes, almost without exception, depend on strict control of reaction times and operating temperatures.

(Tables showing effect of development schemes are overleaf)

SUMMARY OF CHEMICAL DEVELOPMENT SCHEMES

Group 1—Sulphuric acid.
,, 2—Alkalis (including chlorine).
,, 3—Other inorganic acids and salts (including carbide).
,, 4—Industrial gases.
,, 5—Nitrogen fertilisers.
,, 6—Soluble phosphate fertilisers.
,, 7—Other chemical fertilisers.
,, 8—Heavy organic chemicals.
,, 9—Chemicals for pharmaceutical and veterinary products.
,, 10—Miscellaneous fine chemicals.
,, 11—Dyestuffs and intermediates.
Sub-Group 12A—Coloured pigments
,, 12B—Other pigments (including whites and red and orange lead).
Group 13—Explosives.
,, 14—Chemicals for pest control and for agricultural and horticultural purposes not elsewhere included.
,, 15—Plastic materials and synthetic resins.
,, 16—Miscellaneous chemicals.
,, 17—Coal tar distillation products§.
Additional Group (18)—General services and Amenities.

Group	1	2		3		4		5			6		7		8		9		10
	No. of Firms	Schemes in Progress		Schemes Awaiting Licence		Schemes still Tentative		All Schemes		Amount Already Spent	Present Productive Annual Capacity		Total Productive Annual Capacity on completion of Schemes		Decrease in Annual Imports		Increase in Annual Exports		Additional Employees
		No.	Est. Cost (in £000's)	No.	Est. Cost (in £000's)	No.	Est. Cost (in £000's)	No.	Est. Cost (in £000's)	(in £000's)	Tons (in 000's)	Value (in £000's)	Tons (in 000's)	Value (in £000's)	Tons (in 000's)	Value (in £000's)	Tons (in 000's)	Value (in £000's)	
Group 1	48	42	2,872	6	1,370	38	6,877	86	11,119	1,014	1,476	9,545	2,134	14,064*	—	—	—	10	480
,, 2	7	17	26,723	5	8,381	16	3,096	38	39,100	11,411	1,759	22,120	2,611	32,952	—	21	—	4,250	4,170
,, 3	84	73	6,016	11	2,045	58	5,675	142	13,736	2,652	2,561	52,114	3,354	75,821	—	5,401	—	3,858	2,850
,, 4	7	3	2,265	—	—	9	2,021	12	4,286	860	—	8,608	—	11,391	—	160	—	240	1,000
,, 5																			
(*a*) Synthetic nitrogenous fertilisers.	2	—	—	—	—	3	3,590	3	3,590	—	920.8	10,755	1,183	13,702	—	—	—	1,000	280
(*b*) By-product ammonium sulphate.	—	3	138	1	300	2	110	6	548	61	—	—	—	—	—	—	—	—	—
Group 6	12	19	2,332	—	—	12	136	31	2,468	105	1,299	7,762	1,453	9,297	—	563	—	—	— 20
,, 7	1	—	—	—	—	4	11,600	4	11,600	—	172	2,626	710	10,171	—	4,100	—	1,360	1,680
,, 8	40	72	27,763	7	5,478	49	9,553	128	42,794	10,444	848	62,572	1,688	136,646	—	9,153	—	8,538	3,880
,, 9	52	48	3,642	13	385	42	3,104	103	7,131	1,463	—	32,144	—	56,119	—	975	—	8,956	2,110
,, 10	52	37	1,351	3	93	17	418	57	1,862	407	—	14,833	—	23,038	—	1,681	—	4,063	1,230
,, 11	26†	26	11,489	12	3,094	21	1,798	59	16,381	3,155	195.7	38,308	237.9	52,610	—	1,219	—	4,729	2,830
											50‡	18,300‡	66.8‡	26,730‡					
Sub-Group 12A ...	38	34	1,612	2	19	16	297	52	1,928	738	41,271	6,727	53.152	8,593	—	—	—	440	460
,, 12B ...	22	13	1,794	1	9	13	1,412	27	3,215	304	268.69	21,710	333.99	27,147	—	10	—	1,303	650
Group 13	1	—	—	—	—	10	2,031	10	2,031	—	—	10,394	—	12,743	—	—	—	—	— 1,330
,, 14	29	7	184	3	276	10	226	20	686	23	86.415	6 763	96.812	9,390	—	—	—	341	270
,, 15	38	55	17,447	4	533	30	3,974	89	21,974	7,859	185.738	37.741	339.189	71,881	—	3,266	—	7,022	4,500
,, 16	17	15	532	2	130	9	1,285	26	1,947	292	82,826	2,717	56.078	4,906	—	1,810	—	1,028	640
Additional Group (18)	2	10	2,840	3	96	27	2,522	40	5.458	2,069	—	—	—	—	—	—	—	—	—

* Calculated as 100% H_2SO_4. † 15 dyemakers. ‡ Dyestuffs only.

§ Coal tar distillation products have been excluded from this inquiry by agreement between the Board of Trade and the Ministry of Fuel and Power.

Summary of Forward Plans—Cost and Expected Returns

(All values in £000's)

Group	No. of Firms	Schemes			Present Annual Capacity		Ultimate Annual Capacity		Additional Employees	Imports—Decrease in Value p.a.	Exports—Increase in Value p.a.
		Number	Total Cost	Already Spent	Tons	Value	Tons	Value			
1	48	86	11,110	1,014	1,476,000	9,545	2,134,000	14,064	480	—	10
2	7	38	39,100	11,411	1,759,000	22,120	2,611,000	32,952	4,170	21	4,250
3	84	142	13,736	2,652	2,561,000	52,114	3,354,000	75,821	2,850	5,401	3,858
4	7	12	4,286	860	(a) —	8,608	(a) —	11,391	1,000	160	240
5	2	3	3,590	—	920,800	10,755	1,183,000	13,702	280	—	1,000
6	12	31	2,468	105	1,299,000	7,762	1,453,000	9,297	+ 20	563	—
7	1	4	11,600	—	172,000	2,626	710,000	10,171	1,680	4,100	1,360
8	40	128	42,794	10,444	848,000	62,572	1,668,000	186,646	3,880	9,153	8,538
9	52	103	7,131	1,463	(a) —	32,144	(a) —	56,110	2,110	975	8,956
10	52	57	1,862	407	(a) —	14,833	(a) —	28,038	1,230	1,681	4,063
11	26	59	16,381	3,155	195,700	38,308	237,900	52,610	2,330	1,219	4,729
12A	38	52	1,928	738	41,271	6,727	53,152	8,593	460	—	440
12B	22	27	3,215	304	268,690	21,710	333,990	27,147	650	10	1,308
13	1	10	2,031	—	(a) —	10,394	(a) —	12,743	+1,330	—	—
14	29	20	686	23	86,415	6,763	96,812	9,390	270	—	341
15	38	89	21,974	7,859	185,738	37,741	339,189	71,881	4,500	3,266	7,022
16	17	26	1,947	292	32,826	2,717	56,978	4,906	640	1,810	1,028
17		Outside	scope of	enquiry							
18	2	40	5,458	2,069	—	—	—	—	—	—	—
Total	(b) —	927	191,306	42,796	9,846,440	347,439	14,231,021	570,471	25,180	28,359	47,138

(a) Tonnage figures are not applicable to these Groups.
(b) Many firms have schemes in more than one Group.

GELATINE & GLUE RESEARCH

Laboratory Work Begins

THE research programme of the British Gelatine and Glue Research Association has been agreed with DSIR and work on fundamental problems of the industry has begun at the association's laboratories, which have been established at 2/4 Dalmeny Avenue, Holloway, London, N.7. Special emphasis is to be laid on materials and consumer research.

The first numbers of the association's *Bulletin* and *Abstracts* have already been published and the initial meeting of the research panel was held in January.

Regulations for associate membership, which is open to users of gelatine and glue and to manufacturers of equipment for the industry, are now available and can be obtained either from Kidson's, Taylor & Co., Sardinia House, 52 Lincoln's Inn Fields, London, W.C.2, or from the director at the laboratories.

Controlled Blasting

ELECTRIC blasting caps of fractional-second delay have been developed recently in the U.S.A. and are claimed by the manufacturers, Olin Industries, Inc., to reduce vibration from blasting operations and to reduce costs.

Instead of firing one large charge of explosive at one time and setting up one large shock wave, it is possible with the use of the new blasting caps to break up a large charge into smaller portions and fire each at fractional-second intervals.—reports the *Midwest Engineer* (Vol. 2, 13).

The metal caps are accurately timed to permit 10 periods of delay. Eleven-delay periods can be obtained by using the caps in combination with a ventless delay blasting cap. A delay number identifies the caps, which are also supplied with plastic covered wires and plastic shunts.

SUMMARY OF FORWARD PLANS

The ABCM report gives in the following table the increase of raw materials which the proposed expansions are estimated to require.

	Pyrites Tons	Spent Oxide Tons	Sulphur Tons
Consumption in 1948...	227,000	196,000	260,000
Increased quantities required per annum when above schemes are completed ...	189,000	82,000	120,000
Total	416,000	278,000	380,000

TECHNOLOGY AND PRODUCTION

N.-W. Engineers on Current Need for Specialists

CONFIRMATION of the contemporary belief that the well-being of Britain's production industries depended more than ever before on the fuller use of technology and technologists was offered in Manchester on February 3 by Dr. D. M. Newitt.

The president of the Institution of Chemical Engineers was speaking at the annual dinner, which followed the annual general meeting of the North-Western branch of the institution, delegates to which had earlier been welcomed by the Lord Mayor of Manchester and heard a review by Sir Wallace Akers, C.B.E., of possibilities in the development of atomic energy.

Dr. Newitt affirmed that a direct relationship could be discerned between an industry's productivity and the number of technologists it employed. It was one of the factors which helped to explain " the rather high productivity " of industries in the U.S.A. He had little sympathy, however, with the view that when chemical plant or technology was wanted here it was necessary to go to the U.S.A. for it. There was, he thought, some inclination here to be mesmerised by the great technological institutes of America, where chemical engineers were employed very much more freely than was possible here.

He considered that here the urgent need now was to increase the output of technologists, and especially of chemical engineers; and there was a complementary need for widespread technical education to ensure the availability of foremen and other ranks of the same quality. It was, he thought, surprising that Manchester, with its high standards of technological education, still had no university Chair in the very important subject of chemical engineering.

The clear responsibility to provide, in this country, greater facilities for the training of chemical engineering students rested, however, as much upon industries as on the universities. The former now had the opportunity to make an important contribution to that end.

Mr. E. J. Dunstan, re-elected as chairman of the North-Western branch, who presided at the dinner, supported the view that the advance in American industries had gained much of its force from the specialised approach. The obligation to specialise was evident in chemical engineering; no one today could hope to cope at the same time with the great developments in chemistry and in engineering and in that way become an expert chemical engineer.

In the wider view, he was convinced that Britain had the technologists of the right calibre and that the need now was to recapture that pride of achievement which impelled a man to do a little bit more and enabled the nation to do a very great deal more.

The chairman was responding to the toast of the North-Western branch, which Dr. Newitt had proposed. Mr. T. Penny proposed the health of the guests, for whom Sir Wallace Akers responded.

Monsanto Companies Join Forces in India

THE decision of the Monsanto companies in Britain and America to collaborate in India was made known on Wednesday. The announcement from Monsanto Chemicals, Ltd., in London, reveals that the new organisation, Monsanto Chemicals of India, Ltd., will be centred on Bombay and will be jointly controlled by the British company and by the Monsanto Chemical Company in America, whose president, Mr. W. M. Rand, will share responsibility with Mr. Edward A. O'Neal, Jun., chairman of Monsanto Chemicals, Ltd. The other directors named are E. A. Blair, J. W. Urban, Marshall E. Young, W. E. Daysh and B. K. Denton, of whom the last two will exercise local control in Bombay.

The immediate objective is to establish a selling organisation in India and later to manufacture chemicals based on indigenous raw materials.

Nuclear Research

The first Institute of Nuclear Physics in India was opened in Calcutta on January 11 by Madame Curie. This is one of 11 scientific institutions planned by the Government.

GOVERNMENT SCIENTISTS

Lack of Recruits for Higher Staff

TECHNICAL education and the position of scientists in the public service were particularly referred to by Sir John Anderson, president, at the luncheon following the annual general meeting of the Parliamentary and Scientific Committee held recently in London.

While agreeing that technical education admitted of many differences of opinion, Sir John said that he thought that it was generally agreed that there was a need in this country for institutions to do what the universities could not do technically, and to do it up to university standard in the field of technology.

There were, of course, difficulties, one of which was that technical education, unlike university education, fell within a departmental sphere and also that it was, to a large extent, a responsibility of local authorities.

Nevertheless, the fact that we had not got in this country institutions comparable with the Massachusetts Institute of Technology, or those of Charlottenburg and Zurich, was something of which we had to take note.

Interchange of Scientists

With regard to the position of scientists in public services, it has recently been represented to him that there was some feeling of discomfort and disquiet on the part of these scientists, and he thought that some review was justifiable. It might well be worth considering whether it was possible in the highest posts, such as those of scientific advisers to government departments and directors of research organisations, to have some system which facilitated interchange.

Sir Charles Darwin (director of the National Physical Laboratory) also referred to the position of scientists in Government service, and expressed gratitude for the system which enabled a limited number of special promotions to be given for scientific merit.

He did, however, feel alarm about the danger arising from the shortage of recruits for their staff, particularly the higher staff. They had at present no reserves and while it was possible to continue for the time being, this might later prove to be a calamity.

With regard to technical training, Sir Charles considered that serious thought should be given to the present inadequate arrangements for training engineers.

DISTRICT HEATING

Possible Saving of Fuel

THAT there is a case for the introduction of district heating, particularly in the new towns, is maintained by Mr. A. E. Margolis in a paper to be read next month before the Institute of Fuel.

District heating, states Mr. Margolis, has the advantage that in fulfilling its primary task of providing a centralised service it eliminates the smoke nuisance and improves living conditions.

The ease with which heat and power can be co-ordinated in this country is stressed and the warning given that power stations are approaching the limit of thermal efficiency.

Fuel costs and demand continue to increase and it is becoming difficult to find suitable sites for condensing stations with a sufficient supply of cooling water.

Gas and electric heating cannot solve the district heating problem, the author argues, because of their poor annual load factor and the high capital charges of installing additional plant capacity.

Remote Supplies

By combining exhaust-heat storage and thermal-electric storage, the range of district heating service can be extended to isolated groups of buildings, even to villages far from the heat-electric station.

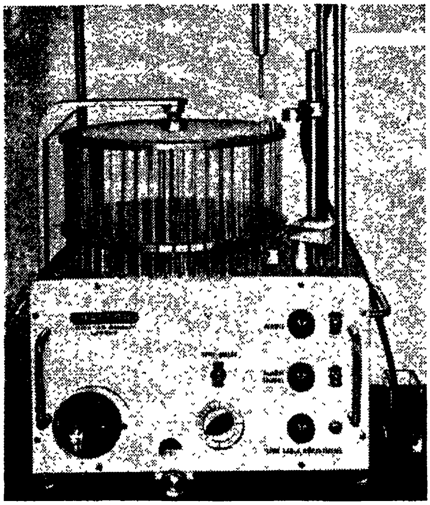
The application of district heating for a new town with a population of 40,000 is examined. A heat-electric station with a total electricity generating capacity of 60,000 kW can be installed, operating with an annual load factor of 58 per cent and an average thermal efficiency of 76 per cent. This would result in an annual saving of up to 79,000 tons of coal.

Power from Peat

ELECTRIC current obtained from peat for use on a commercial scale is said to have been produced by a new generating station at Clonlast, Offaly, Eire. Half the annual production of 2 million tons of machine-won peat would be used for this purpose, stated the Eire Minister for Industry and Commerce, Mr. Daniel Morrissey, at Galway last week.

It is estimated that Clonlast station will consume 120,000 tons of peat a year to generate 90 million units in that time. Two peat-fired stations of greater capacity are being built, the first of which should be in operation by 1952. Each station will work the peat from local bogs.

NEW AUTOMATIC FRACTION COLLECTOR



The base of the apparatus, containing the motor-operated collector unit and the weighing equipment

THE advantages claimed for the use of an automatic fraction collector in chromatography or fractional distillation are that, apart from supplying detailed information, it saves a great deal of labour and time, and provides consistently accurate and comparable data by avoiding the errors due to the human element. The one newly produced by the Shandon Scientific Co., London, illustrated here, is stated to be the first of this type to be manufactured in this country. It was, say the makers, designed with three objects in view: to provide a fully automatic machine; to incorporate in it all features necessary for accurate and safe operation; and to eliminate the necessity for expensive machines with 200 test tube capacity.

The machine will collect fluids in predetermined amounts which are adjustable anywhere between .5 and 15 gm. It consists essentially of a 11-in. diameter circular turntable which carries in one row 50 identical Pyrex test tubes.

The turntable is mounted on a rectangular base, measuring 15½ in. by 8 in. by 9 in. high, which houses the driving motor, the sensitive weighing mechanism and all the electrical gear. It carries three uprights to which the fractionating column can be attached.

Agate Bearings

The weighing mechanism consists of a precision weighing beam, provided with arrestment, which carries at one end a counterbalanced stirrup with a small overhead platform, and at the other end the weight pan on which weights are placed corresponding to the amount of fluid to be collected in each test tube. The whole weighing mechanism is mounted on agate bearings.

For collecting very accurate small fractions of .5 ml. or less the makers supply, as an extra, small calibrated capillary syphons for attachment to the fraction column. Where it is desired to collect automatically a larger number of fractions than 50, i.e., without manually replacing already filled test tubes, the machine can be used in multiple set-ups for collecting 100, 150 or 200 fractions.

Anodic Oxidation Standard

THE electrolytic process of anodising—anodic oxidation—developed after the first world war as a means of increasing the corrosion resistance of aluminium and aluminium-base alloys used in aircraft, is applied to-day in many industries, so that the formulation of a standard of practice was justified. Such a standard has now been published by the British Standards Institution, BS 1615, " Anodic Oxidation Finishes for Aluminium and Aluminium Alloys."

By suitable alteration of the operating conditions of the anodising bath, the properties of the film may be varied to suit the requirements of service conditions. The new standard covers the methods of testing to be employed and the performance requirements of films tested by the standard methods. It has been agreed that it is neither desirable nor practicable to standardise the details of the process by which the film is produced.

The characteristics covered in the British Standard are:—Thickness of anodic coatings, reflection factors, resistance to abrasion; and fastness to light. Work is still proceeding on resistance to corrosion.

Plastics Uses of Diallyl Phthalate

Aid to Production of Special Copolymers

From A SPECIAL CORRESPONDENT

THE monomeric compound, diallyl phthalate, $[C_6H_4(COOCH_2CH:CH_2)_2]$ finds several direct applications in the plastics industry, notably as a low pressure laminating resin, as a casting resin and as a primary plasticiser for imparting low temperature flexibility and low water extraction. In addition, diallyl phthalate is proving important in the production of new copolymers, e.g., copolymerisation with diallyl phenyl phosphonate and other monomers to form so-called "tailored" polyesters.

Physical Properties

These can be made for specific requirements, providing the plastics technologist with a resin possessing the most desirable physical properties. This is well illustrated by the fact that in making glass fibre laminates with polyester resin, it is possible to match the refractive index to the glass cloth so as to give a transparent laminated sheet. The "tailoring" of resins made possible by copolymerisation undoubtedly greatly widens the scope of the plastics manufacturers.

Diallyl phthalate is a low viscosity liquid (12 centipoises at 12° C.) with a specific gravity of 1.120 at 20° C. Its mild, slightly lachrymatory smell does not cause unpleasant effects physiologically if handled with reasonable care. Manufacturers claim that it is not a primary irritant but advise care in handling to prevent long exposure of the skin to the liquid.

The pure monomer can be stored in metal drums and it is not corrosive to mild steel, stainless steel, aluminium, brass, copper or magnesium. Provided containers are not stored near steam pipes or exposed to temperatures above normal and the monomer is not exposed to light, there is no fear that it will gel. Mixed with catalyst, diallyl phthalate will usually commence to gel in 6-8 weeks at normal temperature.

Diallyl phthalate is insoluble in water but soluble in ketones, esters, ethers alcohols and aromatic hydrocarbons. The 30 per cent prepolymer or syrup is soluble in acetone or carbon tetrachloride and the fully polymerised resin is insoluble in all common solvents but slightly affected by chloroform and nitropropane.

The flash point of the monomer is 166° C., and the fire point 182° C. Boiling range at 4 mm. is as follows: below 156° C.—none; below 160° C. maximum 5 per cent; below 170° C. 95 per cent; above 175° C., none.

The vapour pressure at 150° C. is 2.4 mm. mercury and 27.0 mm. at 200° C. Surface tension at 20° C. is 39° per cm. Commercial forms of diallyl phthalate usually contain slight traces of free acid, the maximum being about 0.1 per cent as acetic acid.

The best known catalyst for polymerising diallyl phthalate is, of course, benzoyl peroxide, but other peroxy compounds, such as di-t-butyl peroxide, t-butyl perbenzoate, buty-t-hydroperoxide, lauroyl peroxide and di-t-butyl diperphthalate can also be employed. About 2-5 per cent of the catalyst is generally used, larger quantities causing the reaction to become uncontrollable.

Considerable care is necessary in heating the monomer and catalyst during the early stages of polymerisation as the reaction is exothermic. Unless the initial temperature is kept below 65-66° C. there is a danger of low molecular weight compounds being formed. During the resin-forming there is a volume contraction of about 18 per cent; castings during curing will shrink about 18 per cent, but the use of a prepolymer greatly reduces the volume shrinkage. During the transition from monomer to solid resin by additional polymerisation there is only a very slight loss in weight.

Reinforcements

In the low pressure laminating field diallyl phthalate can be used with a variety of reinforcements, principally glass cloth or fibre, paper and sisal, cotton and linen fabrics. It is possible to produce laminates of many different forms—flat and rigid sheets of great strength and durability, flexible laminates and laminates which may be postformed.

The process of lamination consists essentially of treating the sheets of reinforcing material with prepolymer or allyl syrup, laying up the sheets to build up the required thickness or shape and then subjecting them to heat and low or contact

(continued on page 228)

MODIFIED ANALYTICAL INSTRUMENTS

Microchemists' Informal Display in London

INNOVATIONS and improvisations of considerable originality and utility to analytical chemists were presented after the annual general meeting at the Sir John Cass College on January 27 of the Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists. Good technical descriptions were given in papers presented by members.

A split-type micro combustion furnace, suitable for use in micro-Dumas nitrogen determinations, and determinations of sulphur and halogens, was exhibited and described by Mr. G. Ingram. The furnace, probably the first of its type in this country, is designed for easy replacement of the elements if these burn out, and can be produced quite cheaply.

Mr. Ingram also exhibited a micro-stirrer and a micro-burette. The stirrer is driven by a toy motor, and is fitted on a stand with an adjustable platform. This platform can be used to raise and lower the vessel to be stirred, and has an attachment for test-tubes.

The burette, controlled by a micrometer screw, has mainly been used for determinations of small amounts of iodine, though it is also satisfactory for any ordinary micro-titrations, such as acid-alkali titrations.

Dr. W. T. Chambers showed and described a pressure regulator, and a combustion train for determinations of sulphur and halogens. It was shown in the course of demonstrations that the pressure-regulator maintained a very even rate of passage of gas, and it had the additional advantage that the gas is not bubbled through a liquid at any stage.

Determination of Sulphur

The combustion train, similar in general lay-out to that described by Hallett, contains a number of modifications, notably a less complicated absorber. Efficient mixing of gases in the combustion tube is ensured by passing them through a sintered quartz disc. This disc also provides a safeguard against too rapid vaporisation of the sample. That can be recognised by the behaviour of the pressure indicator, and suitable action can be taken at once.

Mr. F. J. McMurray described a semi-automatic combustion furnace. The short burner is moved independently by a motor, and as exhibited, the furnace, whose electric heaters are thermostatically controlled, is suitable for the estimation of nitrogen, sulphur and halogens. With minor adjustments it can also be applied to carbon-hydrogen determinations.

The movement of the short burner can be controlled so as to make a complete travel of 5¼ in. in from 12 to 25 minutes. Times outside this range can be obtained by adjustment. With this furnace it is said to be easy to carry out ten nitrogen determinations per day, and also to carry on other work. Once the movement of the short burner is started it needs no attention.

Photo-Electric Nephelometer

Mr. A. C. Mason demonstrated a photo-electric nephelometer made largely from ordinary laboratory apparatus. It had been developed for investigation of the nephelometric determination of potassium by cobaltinitrite. Although this method was ultimately abandoned, the nephelometer continued in use, and was suitable for a wide range of turbidities, as was shown by Dr. A. J. Lindsey. Where separations are being carried out, disturbances of the electrodes must be avoided. The use of an ordinary water-bath for heating purposes, with subsequent replacement by a cooling vessel, are complicated by this requirement. The split block may be readily removed, in two sections, and placed on a special stand, its place on the electrolysis stand being taken by another cold block of the same pattern.

Mr. M. A. Fill described rotary stirrers and a simple micro-burette. The stirrers, which may be used in conjunction with a platinum wire stirrer or a magnetically operated mechanism, are constructed on an air-turbine principle. The outer casing, made of two plastic bottle caps, contains a rotor easily constructed from an ordinary cork, and this may either be connected to a platinum stirrer, or may carry a small but powerful magnet. With smaller models of the stirrer, as many as 2000 revs. per minute may be achieved. The micro-burette, made from a graduated pipette, is controlled by a tiny air-leak, which in its turn is ingeniously adjusted by a screw-clip. Mr. Fill also presented for inspection a variety of micro-stands and clamps made from plastic caps and glass rod.

Mr. P. Heath described modifications of

the Lidstone-Wilson micro hydrogen sulphide generator. An internal scrubber ensures complete removal of acid-spray contaminated with iron, while the rate of delivery is controlled by a bubbler rigidly attached to the outer jacket. The construction of the table carrying the iron sulphide is simplified, while the gas is delivered through a capillary inserted in a rubber diaphragm, rather than through quill tubing drawn out to a capillary. In this way considerable wastage of glass tubing is avoided. Mr. Heath also described the application of such a generator to the pressure method of precipitation as well as to the bubbling method.

Apparatus for conductometric microtitrations, robust and particularly suited to demonstration and teaching, was described by Dr. J. T. Stock. The electrodes are constructed from platinum wire rather than from platinum sheet, and several methods of simple and rigid construction are possible.

Because of the very small area of the electrodes, leading to ready polarisation, the solutions titrated should not be too concentrated. Very slight polarisation, not sufficient to affect the results seriously, was shown when titrating N/100 HCl by N/10 NaOH, and no polarisation could be detected when these concentrations were reduced to one-tenth. The characteristics of the instrument prevent further dilution, but working within the range indicated, results are very satisfactory.

The titration vessel can be stirred by a toy electric motor carrying on its spindle a powerful magnet. This is fixed below the titration vessel, and rotates a tiny steel bar, sealed in glass, lying in the bottom of the vessel. Vigorous agitation is achieved at the bottom of the solution, where it is most necessary, but there is little disturbance at the surface of the liquid, and consequently little danger of splashing. Alternative stirring may be provided by a turbine-driven magnet.

At the annual general meeting of the group the following office-bearers were elected for 1950: Chairman, Mr. R. Belcher; vice-chairman, Dr. C. L. Wilson; hon. secretary, Mr. D. F. Phillips; hon. treasurer, Mr. G. Ingram; members of committee: Mr. A. E. Heron, Mr. R. F. Milton, Dr. J. Sandilands, Mr. C. E. Spooner, Mr. D. W. Wilson, Dr. G. H. Wyatt.

PLASTICS USES OF DIALLYL PHTHALATE

(*continued from page* 226)

pressure to effect a cure. Curing cycles vary from 5-144 hours for monomer with 2-5 per cent catalyst or 30 minutes to 4 hours for 30 per cent prepolymer with catalyst. Recommended conditions require starting temperatures at 75-80° C. increased over a period of half an hour until a top temperature of 115-125° C. is reached. These figures are merely indicative of minimum and maximum temperatures; most fabricators have developed their own cycles for specific types of laminations.

Advantages of the allyl esters for low-pressure laminating may be summarised: (1) Quick curing at low temperatures and contact pressure; (2) Good initial tack and adhesion to glass fibres and other reinforcing materials; (3) Ease of forming large shapes; (4) Formation of transparent, dimensionally stable resins that are non-toxic; (5) Formation of thermosetting resins that possess good surface hardness and are non-inflammable; (6) Good electrical properties of polymer; (7) Excellent mechanical strength of allyl resins; (8) Ability to modify the resins by copolymerising, *i.e.*, using mixtures of monomers.

Sheets, rods and tubes can be formed by casting allyl resins in glass, metal, rubber, wood, plaster or wax moulds. Success in casting depends on several factors, notably the use of a prepolymer with catalyst; lubrication of the mould with suitable lubricant (*e.g.*, silicone fluid); careful control of temperature up to gelation and gradual increase until cure is effected; completion of cure at an elevated temperature (230° to 250° F.).

The cast allyl resins possess good surface hardness, excellent optical properties and resistance to chemical attack, crazing and distortion under heat.

For low temperature flexibility and low water extraction the inhibited monomer is suitable for a wide range of plastics, including alkyd resins, cellulose acetate, cellulose acetobutyrate, cellulose acetropropionate, cellulose nitrate, ethyl cellulose, polyvinyl acetate, polyvinyl butyral and polyvinyl chloride.

Because of its high volatility, diallyl phthalate is not suitable for imparting permanent flexibility. Probably its most important plasticiser application is as a thermo-setting plasticiser for resins requiring non-migrating additives. For this particular purpose the monomer is, of course, not inhibited.

PRESENT TRENDS IN BAKING RESEARCH

Effects of Silicones, Mineral Oil, and Anti-Staling Agents

by JOHN B. M. COPPOCK, B.Sc., Ph.D., F.R.I.C.

THE food industry is at present faced with an ever-increasing number of new chemical materials possessing a wide variety of potential uses. Emulsification agents, for example, might be used for extending fats, anti-oxidants might be used for preventing rancidity development, both inorganic and organic chemicals might be suggested as improvers of the baking quality of flour, or again find use as foaming agents or as agents in the improvement of hygiene in the form of detergents, insecticides, etc.

Each of these substances may possess potentially toxic characteristics and it is of the utmost importance that there should be complete physiological data regarding any new substance which might find its way into edible products, so that suitable limits may be prescribed for its use.

There are three main types of materials about which detailed physiological data and, in many cases, nutritional data will be required before the baking industry can feel adequately safeguarded regarding their utilisation. They are:—

(1) Those which are included as ingredients, whether as fat extenders, or extenders of other materials, flavouring agents, aids to better distribution of ingredients, anti-oxidants, or as preservatives.

(2) Those materials used in baking operations which might be absorbed by doughs or batters during processing.

(3) Those materials distributed in a bakery for hygienic purppse, which might be absorbed by doughs or batters.

Absorption Conditions

Detailed information regarding absorption, metabolism and toxicity are necessary in the case of those compounds listed under (1). In the cases of the compounds (2) and (3) the first problem is to determine the extent to which they are absorbed by the food product under conditions specified for their use, or alternatively to determine conditions under which absorption does not occur, or occurs to a negligible extent; this latter problem is tied up with determinations of the levels at which toxicity becomes manifest.

Silicones have been used in America and on a restricted scale in this country for producing water repellent glazes on baking tins, so obviating the use of tin greases. When dissolved in a solvent, these silicone solutions can be painted, sprayed, or otherwise distributed on a baking tin, and, after drying to remove the solvent, are cured by baking at the usual temperature. This curing produces a thin, durable glaze which can stand repeated use approximately 200 times without renewal of the coating.

Silicone Tests

Careful investigation of the possibility of absorption of the resin by bread baked in tins coated with these resins has indicated that no absorption of silicone by the bread crust occurs. From considerations of the loss in weight of a normal silicone film during a series of baking experiments, the maximum amount of silicones that could be taken up by a loaf was 0.00005 per cent. It is not considered that this amount is of physiological importance.

The DDT smoke-fumigation method of destroying insect life in bakeries has attracted much attention. In the U.S.A. the Federal Food and Drug Administration will not permit any residual DDT in foodstuffs. In Britain no authoritative statement has yet been made as to the quantity which might be permitted as a residue in baked goods.

The toxicology of DDT has been examined exhaustively and it would appear that in extremely small quantities there may be little harmful results from its use, although its chronic toxic effects are not yet fully understood and very careful control may be necessary.

This control must extend beyond the bakery. DDT is used as a fumigant in flour mills, and the Ministry of Agriculture has no objection to its use, provided the flour does not contain more than 7 p.p.m. of DDT. Recommendations have been issued to the baking industry that no baked product should contain DDT in excess of this figure.

The mode of distribution of mineral oils in doughs has been studied at great length. The degree of retention of the oil varies considerably with different recipes.

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* Summary of lecture given before the London and South Eastern Count'es Section of the Royal Institute of Chemistry

Earlier work indicated that mineral oil strongly adheres to the grain structure of bread, even after enzyme degradation. A starch bread containing no gluten will retain much of the oil on attempted extraction, and addition of gluten to a normal wheaten dough renders the mineral oil even more difficult to extract.

Microscopic examination of bread doughs indicates that, when mineral oil is slightly absorbed, as it would be from a tin grease, it is readily dispersed as a continuous film throughout the dough.

Physiological Damage

The new Mineral Oils in Foods Order gives a tolerance of 0.2 per cent of mineral oil present in baked goods, consequent on mechanical lubrication. At this level the particles which Frazer has shown might cause potential damage to the liver of 0.5μ or less are absent, and the dispersion of the oil is in a form of a continuous film, which even after enzymic digestion does not appear to break up. The likelihood of physiological damage to the consumer is remote.

Polyoxyethylene stearate was first described by Favor and Johnston as a crumb-softening agent for bread and already has found very extensive use in America. There it is used at levels of approximately 1 per cent of the flour weight. The commercial material contains from 4-18 oxyethylene groups, and 0.3 per cent ethylene glycol is often present as an impurity.

In British breads a crumb-softening effect is obtained with polyoxyethylene stearate (POES) at a 0.2 per cent level. In experiments, loaves containing POES showed a greater volume and a higher average weight than the controls.

Using a "firmness test," it was found that the firmness of unwrapped breads containing no POES increased rapidly with time, while those containing POES showed only a slight increase. Even where the moisture losses of the control and the POES-containing loaf were identical, the POES-containing bread was the less firm.

From these experiments it would appear that this material might greatly improve the keeping quality of bread. Physiological data in America and elsewhere have generally been favourable, but recent experiments have led to some uncertainty regarding the use of this material in human nutrition.

So long as there is any doubt of this type, such materials should not find their way into edible products such as bread, however attractive they may be.

The foregoing illustrates probably better than any other example the urgent need for exhaustive physiological examination of materials of this type prior to their incorporation in food. It is an indication of the work that lies before the food scientist. It is an undeveloped avenue in research in both bakery and food science, and one which holds opportunities for those prepared to follow it to the end.

Several speakers in the discussion which followed the presentation of the paper confirmed the belief that there is need of much more stringent tests of materials incorporated intentionally or otherwise in foodstuffs. Mr. A. L. Bacharach stressed the importance of prolonged and detailed tests of chronic toxicity by the pharmacologist (rather than the physiologist).

Mr. E. B. Bennion urged the need for haste in completing such experiments on such things as polyoxyethylene stearate, recalling that it had taken the Ministry of Food six years to put a stop to the use of mineral oils as food ingredients. There was always the risk of the appearance of new products with high-sounding names having perhaps as their active principle one of the materials about which little is known.

Toxicity Problems

Mr. Hymas asked if we were not being over cautious in regard to the use of DDT, in view of the number of clinical trials that had demonstrated its non-toxicity.

Dr. Coppock said that his recent visit to the U.S.A. had brought him in touch with some very recent work on the chronic and acute toxicities of DDT, which indicated that it was considerably more toxic than had hitherto been supposed. To the further question by Mr. Hymas as to the use of alcohol instead of acetone for the extraction of DDT Dr. Coppock said that in his laboratory alcohol had been found more suitable than acetone.

Retarding Dough Formentation

SCOTTISH food chemists have been showing considerable interest in practical work now being done on retardation of fermentation in dough. The process received a somewhat hesitant reception in England but installations in Motherwell and Stirling, where excellent results have been achieved, have created interest in Scotland.

An essential feature of the process is that dough can be prepared to a given point and retained in cold storage for use the next morning or later. Fermentation experts are now studying the performance of yeast under the new process.

Difficult Moisture Determinations

Comparisons of Methods and Equipment

MODERN methods of moisture determination were the subject of several papers and discussion at a meeting in London last week of the Physical Methods Group of the Society of Public Analysts and Other Analytical Chemists, with the president, Mr. George Taylor, in the chair.

Developments in the use of the Karl Fischer reagent were dealt with in the opening paper by A. G. Jones. Methods for determining the end-point of titration were explained. Finally, referring to the versatility of the Fischer method, the speaker commented on the determination of water hydration of inorganic compounds, the reaction of these compounds themselves with the reagent and the determination of organic functional groups through organic reactions in which water is liberated or consumed.

A radio frequency moisture meter for routine control, based on the change of the permittivity or dielectric constant of the sample material with variation of moisture content, was described by A. T. S. Babb.

Mr. R. W. Money followed with a discussion on the necessity for determining moisture contents of the order of 0.1 per cent in granulated sugars.

The reference methods (AOAC) were too time-consuming for the routine control purposes required, while in the straightforward vacuum-oven methods the experimental errors were too large.

Preparation of reference samples presented difficulty owing to rapid changes in moisture content and to overcome this difficulty a method was developed of conditioning small samples in atmospheres of high relative humidity.

The Karl Fischer method and apparatus were modified and gave good results, but the frequent standardisations involved were only justified if the apparatus was in continuous use and the operation required a high standard of technique. An air-flow method was therefore developed.

Finally, the determination of moisture in tobacco was the subject of a paper by Mr. G. F. M. Fryd, who said that an attempt had been made in the Government Laboratory to find an explanation for the not inconsiderable component of this apparent moisture which does not exist as H_2O in the undried tobacco, but is produced either by reactions of the Maillard type or by other reactions involving reducing sugars.

Italy Studying Native Activated Alumina

RESULTS of tests with Italian activated alumina, leading to the recommendation that the Italian chemical industry may well use the home-produced article in preference to the silica gel at present imported, are reported by G. Di Giulio, of the research department of Indust. Naz. Aluminio, Porto Marghera, in *La Chim. et l'Ind.*, 1949, *31* (10), 360-362. These results confirm and supplement those already made known in published literature. Particular reference is made to the work of Thibon *et al.* (*La Chim. et l'Ind.*, 1947, *57*, 117).

Four samples of varying fineness were prepared, of the Bayer aluminium hydrate type: (a) 10-60 micron, (b) 1-2 mm., (c) 3-5 mm., and (d) 9-10 mm., with combined water 34.51, 33.65, 32.60 and 32.30 per cent respectively (theoretical 34.62). The loss on roasting at 1200° C. was about 9.5 per cent. Re-absorption of water by the four samples was then found to be 20.85, 19.5, 19.5, and 8.2 per cent respectively. At this stage the sample (d) was eliminated as practically useless.

Both static and dynamic absorption tests were then made, the latter with samples (b) and (c) with air velocities ranging from 25 to 100 lit./hr. Total water absorption with both samples ranged from 15.4 per cent at 100 lit./hr. velocity to 18.9 per cent at 25 lit./hr.

In the static tests, the water absorbed as percentage of alumina after 5 hours' exposure was (a) 2.4, (b) 2.7, (c) 2.95; after 8 hours, 20.7, 19.3, 19.2 per cent. Reactivation tests gave about the same relative results for the three samples, *i.e.* (a) was slightly more than (b) and (c).

Indian Plastic Clay

Plastic clay of a high grade has been located in the Tumkur district of Mysore, India. The deposits, estimated at more than 5000 tons, are said to be comparable with Czechoslovakian clay.

Increasing the Hardness of Diamonds

Possible Application of Atomic Energy

AN interesting possible application of atomic energy is that of changing the colour and other properties of gems, especially diamonds. In the case of diamonds it is suggested that hardness also may be increased, thus making the lower quality stones more suitable for industrial uses. These possibilities are claimed in a recent patent, open to public inspection, No. 18986/1949, in the name of N. E. Nahmias (Conv. date 31.5.48).

The method consists of the use of neutrons to produce permanent colour change by altering the " pigmentation " factors in the nuclear structure, thus modifying physical and chemical properties, *i.e.*, transmutations *in situ*. Neutrons must be so selected that they have no adverse effect on the main structure of the gem, such as carbon in the diamond, which might be converted into boron under energies of about 20 MeV.

Reactions of Impurities

The nuclear reactions of impurities and colouring matter must be such that there is no risk of return to the initial element, *e.g.*, through the beta radioactive element, as exemplified in the case of Al^{27}. Other necessary conditions are stipulated as to the amount of neutrons per sq. cm./sec. and their appropriate action.

The number and percentage of impurities in gems are very variable, and it is therefore impossible to predict all the nuclear reactions during and after neutron bombardment. Experiments with gems of which the chemical composition is accurately known—to the standard required in nuclear research—will enable irradiation effects to be classified. Chemical analysis of impurities will be facilitated by study of half-lives and other manifestations. Better knowledge of impurities will also facilitate the study of variable physical properties of diamonds, *e.g.*, significance of variations in Ångstrom readings, nature of Laue spectrograms, hardness, etc.

It is not unlikely that some impurities act as catalysts in the transformation of graphite to diamond, with considerable shortening of the time factor (Bridgman, *Jnl. Chem. Phys.*, 1947, *15*, 52). In order to evaluate the number of neutrons per sq. cm./sec. required to modify appreciably the amount or nature of impurities and therefore colour, 1 g. of diamond is taken by way of example. This contains 5.10^{22} atoms of carbon and 5.10^{15} atoms of impurities of mean atomic weight 50. (This diamond appears to have been exceptionally impure.)

It is known that 10,000 neutrons at least are necessary to touch one nucleus, so that 5.10^{22} neutrons are needed to transform all these impurities. Efficiency will vary directly with multiple diffusion and inversely with neutron absorption by residual nuclei. If it be assumed that these effects cancel out, a source of more than 10^{21} neutrons is needed to bombard this diamond, the total surface of which is assumed to be about 1 sq. cm.

Calculations show that an atomic pile of 1 million kW. gives a flux of 10^{21} neutrons per sq. cm./year. It is fortunate that the presence of a large quantity of diamonds in the pile will not disturb its behaviour because, generally, such atomic piles use carbon as a neutron slowing medium.

It is not, however, necessary to wait a year for colour changes, for colour is due to a combination of factors, including impurities. It is claimed that after a few weeks' irradiation the initial percentage of impurities will have changed and new pigments been formed. Gamma, beta, and x radiations are also present in the pile, and will be produced in irradiated diamonds. These, too, will modify colour. It is therefore necessary to get rid of this transitory colour change by heating the diamonds to a sufficiently high temperature or exposing them to sun- or ultraviolet rays. It is also necessary to wait until all radioactive elements formed *in situ* have dispersed.

Future Applications

Such radioactive treatment will be followed by standard methods: Geiger counters, photographic plate, or self-counting crystal. Only in this way can permanent colours be obtained.

It is claimed that by neutron radiation it is possible to determine the nature of the impurity which renders stones unfit for industrial use, and make better selection of gems for such uses.

The use of diamonds, natural or synthetic, or of purified transformed graphite, as a slowing medium for neutrons in the pile, may be another application of this invention. Piles less than the 1 million kW capacity would serve.

The Chemist's Bookshelf

AN INTRODUCTION TO MOLECULAR SPECTRA. R. C. Johnson. Methuen & Co., Ltd. Pp. xiii + 296. Plates VIII. Figs. 151. 40s.

In the preface to this book the author states that he has "attempted to provide a text-book for the student who has graduated in physics or chemistry, or who is approaching graduation, and desires an understanding of the subject within the limits of ordinary mathematical equipment at that stage. Thus, at one or two points I have introduced the results of wave-mechanics, but I have not assumed familiarity in the use of this method." It is of interest to examine, from the point of view of the chemist, how far this has been achieved, and, how far the implied assumptions are justified. First, it is doubtful if the book would attract the student about to graduate in chemistry, or would, indeed, be worth the necessary effort to master the subject at that stage, unless he were a student who felt strongly that he had a vocation for this field, and that he must, even at that crowded stage, attain to a full knowledge of the historical development and classical physical background of the subject. Even for the graduate it is probable that there is too much detail, except for the specialist—who may well have a closer acquaintance with wave mechanics than the author assumes. The reviewer cannot speak for the physicist at the same level.

Without the preliminary of an introduction to atomic physics, for which the reader is referred to another monograph by the author, a brief description of the phenomena observed in band spectra leads to a full discussion of the subject. Where questions of valency arise the reader is again referred elsewhere, only a very sketchy treatment of molecular levels and the general problems of valency being given. Following this (the first third of the book) the next section is concerned with fine structure and related phenomena. The final third devotes one chapter to the spectra of polyatomic molecules, one to the Raman effect, and one to various applications of molecular spectroscopy. For the chemist these three chapters are probably of most interest. But it is noteworthy that the applications to chemistry which are chosen as representative are dealt with in six pages, and are concerned solely with absorption in the visible and ultra-violet. Biochemical applications are also accorded six pages.

The majority of the 300 references are to the early work in journals and monographs, only 30 referring to the period after 1940 (of which 17 occur in the 10-page section on applications to astrophysics) and a further 45 to the period 1936-1940. It is not clear why, in a book published in 1949, the preface should be dated 1945. This, coupled with the lack of recent references and of the knowledge of the strides, of interest to the chemist, that have been made in this field in recent years, does not give the reader confidence in the up-to-dateness of the information, although the classical treatment is sound.

The general lay-out and typography of the book are, unfortunately, not attractive. The pages have a crowded appearance and in many cases the diagrams, which in themselves are excellent, give the impression that they are inextricably mixed up with the text.—C.L.W.

INTRODUCTION TO CHEMICAL ENGINEERING THERMODYNAMICS. J. M. Smith. London. McGraw Hill. Pp. X + 386. 84s.

The fact that thermodynamics is not merely a sport of experts in applied mathematics but a useful working tool for chemists and chemical engineers is becoming more widely appreciated. While the chemist uses these laws in studying chemical equilibrium and thermal effects, the chemical engineer also finds them useful in several processes of transfer of energy. This is why a new work on the subject, directed specifically to chemical engineers, merits careful consideration. One's major impression of the present work is, in fact, favourable.

A genuine attempt has been made to develop the subject by discussion of the physical realities with a minimum of mathematics. It has previously been pointed out (THE CHEMICAL AGE, *61*, 829) that the subject is best taught by giving applications which clearly indicate its usefulness, thus fixing the methods and conclusion in the mind of the student. This approach is consistently followed here.

An English reviewer, however, has one or two reservations. In a field in which large numbers of symbols are used and formulæ remembered by symbols, complete consistency is essential. One notes with regret, therefore, that there are some discrepancies between the list of symbols used in this work—which are very clearly tabulated—and those recommended in B.S. 813. Thus, for instance, π is given as the British recommendation for pressure, but this volume uses ρ. To define a "standard state," B.S. 873 uses 0 as a right-hand superscript, while J. M. Smith uses 01. For the Gibbs Free Energy $(=H-TS)$, one uses in Britain the symbol G, and J. M. Smith uses F, which is recommended in the British Standard as the symbol for the Helmholtz Free Energy $(=U-TS)$. These differences, resulting in equations which will look different, are liable to confuse students.

A further defect from the standpoint of the self-student is that no answers are given to the excellent sets of problems which conclude each chapter. This limits the usefulness of the book for a category of reader probably far outnumbering those likely to use it at a teaching institution. With these reservations, however, it seems a very useful book for undergraduates in their later years working with a good teacher.

CRUCIBLES: THE STORY OF CHEMISTRY. Bernard Jaffe. Third edition, 1950. Hutchinson's Scientific and Technical Publications. Pp. 480.

The demand for popular presentation of the fundamentals keeps pace, at least, with the multiplication of the arresting recent results of scientific research. Bernard Jaffe's present considerably enlarged edition of the book for which he was awarded the Francis Bacon Award for the Humanising of Knowledge (£1500) in 1930, serves that need on an ample scale and is well designed to give the non-scientist a colourful yet factual account of historical episodes in the development of chemistry from the long dark gropings of the alchemists to some of the contemporary applications of the products of nuclear fission. Characteristic of the chapters of the original work and the four new chapters summarising the approach to nuclear fission and its results is the skill with which are presented the personalities of the men who led the way into these new fields of knowledge. It is essentially a "human" book, well adapted to stimulate in the casual observer of scientific affairs a better understanding of the methods (and the tribulations) by which surprising discoveries of the present time were reached. It makes clear, as some writings on the subject do not, how great a debt chemists owe to the alchemists for their laborious production of the basic equipment of all chemical laboratories. Written by an American, for American readers in the first instance, the book's account of the steps leading to the disintegration of the atom and subsequent events tends to give an unbalanced picture, in which the work in countries other than the U.S.A. gets rather scant acknowledgment.

METALLOGRAPHY DES MAGNESIUMS und seiner technischen Legierungen (Metallography of Magnesium and its Technical Alloys). 2nd edition. W. Bulian and E. Fahrenhorst. 1949. Berlin / Gottingen-Heidelberg: Springer-Verlay. Pp. 140, with 250 illustrations.

This second (1949/edition), dealing with the metallography of magnesium and its technical alloys, is one of a series of monographs on pure and applied metallography published by Springer-Verlag, of Berlin and Heidelberg. The authors are Walter Bulian and Eberhard Fahrenhorst, the former being director of the metallurgical laboratories of Wintershall AG. Both are former contributors to the literature of magnesium. The new and enlarged edition, with author and subject index, presents 250 illustrations, including many microphotographs of ×1000 or more (electron microscope).

The most important sections of the monograph, those dealing with alloys, are limited almost entirely to the Mn-Mg and Mg-Al-Zn groups, which, industrially, are, of course, so far the most valuable. The first group, containing 1.4-2.0 per cent Mn, is particularly useful because of its easy workability, resistance to corrosion, and ready weldability. The 1.8 per cent Mn type, however, has certain defects in the cast state, such as coarse granulation and its attendant disadvantages. Only passing reference is made to numerous attempts to remedy this by addition of Ca and Zr. The addition of Hg appears to be of little practical interest at the moment. The Al-Zn-Mg group is fully dealt with, including some of the most recent research.

FRENCH LEATHER RESEARCH

Cultivation of Colonial Tannins

A WIDE range of studies on leather tanning materials and processes is described in the report for 1949 of the Research Institution of the French Leather Industry, at Lyons.

Some interesting work has been done in connection with the use of tanning extracts for the disincrustation of boilers. Among the conclusions arrived at was that oak bark extracts produced the same favourable results as did horse chestnut extracts, but that sulphite cellulose extracts were not effective.

Mineral tannages were studied intensively during the year, with particular attention to the influence of organic salts on chrome alum and sulphur of alumina solutions. Certain conclusions of this study, which forms the basis of a thesis by Monsieur Grall, tannery chemist and engineer, are likely to lead to interesting practical applications, and the necessary steps have been taken to implement this.

The research work on vegetable tanning products, with a view to their cultivation and use in the French Union, has made little headway in the year, mainly because of the difficulty of finding the necessary materials. This may, in part, shortly be solved by the supply of a tanning product extracted from the bark of an Australian eucalyptus which is now cultivated in Morocco and to some extent in south-western France, in the Landes region. The tree is the *Sideroxylon Eucalyptus*, and the tannin from the bark seems to be of very good quality. This research is proceeding satisfactorily.

The material available for laboratory tests in regard to chamois tanning is not sufficient for practical research and scientists were only able to carry out laboratory work on the oxidisability of oils.

Copper Pipe Failures

THE British Non-Ferrous Metals Research Association has published its findings, based on several years' research, on the behaviour of copper in supply waters.

Experiments indicated that carbonaceous films were responsible for at least three-quarters of the cold water pipe failures examined. Some of the remaining failures are believed to be caused by a type of oxide scale formed in tubes during manufacture. These conditions both lead to pitting in uninhibited waters.

MEXICAN STATE DRUGS

Merger of German Interests

THE Mexican government is planning to create a federally-operated pharmaceutical products company, built around the property and rights of a group of formerly German-owned drug houses. These include Casa Bayer, the Behring Experimental Therapeutic Institute, Merck Mexico (the Mexican subsidiary of E. Merck, Darmstadt, Germany), Schering Mexican Chemical, Beick Felix & Co., Carlos Stein & Co., Codex Laboratories, Gran Drugueria del Refugio and Stein Drugery.

The Mexican State industry will use the factories, land and equipment and the trade names, patents and markings of the following firms: I. G. Farbenindustrie, Chemische Fabrick Auf Actien, Schering Kahlbaun, Asta Aktiengesellschaft Chemische Fabrick, Knoll, E. Merck, P. Beiersdorf & Co., Chemische Fabrick Pilot, E. Tasechner, Chemische Fabrick Promohts, Ichtiol Gellschaft, Cordes Hermanni, Desitin-Merk Carlo Clinke, Liguer Werke, and Chemische Fabrick Helfenberg.

Tests with Radioactive Insecticides

THE successful results obtained by Pestox 3, the recently developed systemic insecticide, offering marked effectiveness in preventing virus diseases transmitted by aphids, were called to mind by Sir Guy Marshall, chairman of Pest Control, Ltd., at the company's first annual general meeting.

The chemical research laboratory had synthesised a number of new chemicals for biological testing, said the chairman, and for test purposes had produced radioactive isotopes of the chemicals, believed to be the first radioactive systemic insecticides made in the world.

The New Flour "Improver"

A STATEMENT recently issued by the Ministry of Health and the Ministry of Food suggested that the supplies of the new flour improver (chlorine dioxide), recommended to replace agene, and the plant to make it may have to be secured from the U.S.A.

This, according to one of the principal suppliers of agene in Britain, does not reflect the true position. The facilities exist here to produce chlorine dioxide in the requisite grade and quantity, if manufacturers are given adequate notice.

PERSONAL

APPOINTMENTS of 13 full-time professors at the North Staffordshire University College, to be opened at Keele, near Newcastle-under-Lyme, in August, were announced last week. MR. H. D. SPRINGALL, senior lecturer in chemistry, Manchester University, will be professor of chemistry, and MR. F. A. VICK senior lecturer of physics at the same university will be professor of physics.

MR. C. W. ROBINSON has tendered his resignation as secretary of the Association of British Pharmaceutical Industry and has accepted an appointment in the industry. He was appointed secretary of the association (then the Wholesale Drug Trade Association) at the end of 1945 in succession to Mr. Arthur Mortimer. During the four years of his secretaryship a considerable reorganisation of the association's activities has been carried through, culminating in the successful merger with the Pharmaceutical Export Group at the end of 1949. The date of Mr. Robinson's retirement and the identity of his successor are not yet known.

MR. C. E. J. SENDALL and MR. A. J. JONES are to retire from the board of Evans Medical Supplies, Ltd., and will relinquish their executive offices after the annual meeting of stockholders later this year. MR. C. W. ROBINSON (at present secretary of the Association of British Pharmaceutical Industry) is to join the board of the company later this year as full-time pharmaceutical development director.

MR. F. YEO-THOMAS who has been appointed the Federation of British Industries' new representative in Paris, has a distinguished record in two wars. During 1941-1944, he was parachuted into France three times and, in 1944, was arrested by the Gestapo, escaped from Buchenwald and returned to England. He was awarded the George Cross and M.C. and Bar, the Legion of Honour and the Croix de Guerre with four Palms.

The appointment of MR. GODFREY CLAXTON and MR. R. A. FRASER as chief chemist and assistant chief chemist, respectively, has been announced by the National Benzole Co., Ltd. Mr. Claxton became the company's research chemist in 1935.

SIR FREDERICK BAIN, deputy chairman of I.C.I., sailed on the *Queen Mary* this week to tour the company's interests in North America, including its largest overseas subsidiary, Canadian Industries, Ltd. He will be guest speaker at the annual dinner in New York of the American Society of Chemical Industry on February 17.

MR. V. A. LOWINGER, C.B.E., has retired from the chairmanship of the International Tin Research and Development Council, which controls the Tin Research Institute. His successor is MR. G. F. A. BURGESS, a joint managing director of the British Metal Corporation, Ltd.

MR. CHARLES JAMES WRIGHT, of Paisley, technical adviser to J. & P. Coats, Ltd., has been elected a Fellow of the Textile Institute. Mr. Wright has made substantial contributions to original work in colour dyeing, and has been responsible for special research investigations into detergent treatments and their relation to fastness, and the exhaustion and diffusion of vat dyestuffs from alkali-hydrosulphite dyebaths.

DR. FRANKLIN T. PETERS has been assigned to the newly formed development department of Glyco Products Co., Brooklyn, N.Y. The doctor, who has been with the company since 1947, was formerly with E. I. Du Pont de Nemours & Co. in a research capacity.

MR. ARTHUR PERRINS BEVAN, of Liverpool, a past president of the National Paint Federation, left £10,898 gross, with net personalty £10,582.

MR. HERBERT EDWIN JONES, of Hartford, near Northwich, industrial chemist, left £23,264 gross, with net personalty £22,915.

Scientific Essay Awards

Prizes to the value of 85 guineas are to be awarded by Imperial Chemical Industries, Ltd., publishers of *Endeavour*, for essays on a scientific subject. The primary purpose is to stimulate younger scientific workers (under 26) to take an interest in the work of the British Association and to raise the standard of scientific writing.

COMPARATIVE PROGRESS IN GERMANY

Substantial Advances in East and West

THE Economic Plan for the Soviet zone of Germany envisages an increase in chemical production by 20 per cent for 1950. Greatly enlarged production quotas have been imposed by the Ministry of Planning on the heavy inorganic chemicals factories, especially on the sulphuric acid plants. These raised their output from 155,000 metric tons (SO_3) in 1948 to 180,000 tons last year, thus removing one of the most serious bottlenecks in the Soviet zone economy. Production is expected to reach 250,000 tons in 1950, provided the projected plant replacements and extensions can be carried out in time.

The potash industry, concentrated in 17 mines with 187 shafts in Thuringia and Saxony-Anhalt, is to increase its output by 15 per cent this year. A new potash mine is to be opened, and technical improvements and extensions are to be effected in those already operating, in order to provide larger supplies for foreign customers, among whom Poland, Czechoslovakia and the Scandinavian countries are now most important.

The nitrogen production target has also been raised with a view to procuring larger supplies for export. The Leuna plant, still the leading producer in the Soviet zone, is to produce 150,000 metric tons (N) this year. Larger exports of nitrogenous fertilisers are to pay for increased imports of crude phosphates, especially apatite from the Kola peninsular.

In the 1948/49 agricultural year Soviet zone fertiliser consumption was reported as including 174,000 tons N, 60,000 tons P_2O_5 and 235,000 tons K_2O. For the current year farmers are promised larger supplies of all three fertiliser components; in this way it is hoped to regain pre-war yields in agriculture.

More Oils

Much attention is being paid to extension of the production of fats, oils, soaps, etc. Distillation of crude fats has been resumed at the works of Deutsche Hydrierwerke at Rodlingen, where the paraffin oxidation plant is to be restored. A new wood distillation plant has been erected at Mellensee. The production of mineral colours is to be undertaken at Fürstenwalde. The manufacture of catalysts for hydrogenation works started at Leuna before the end of last year.

Among other new products is an anti-corrosion lacquer made from artificial resin. Many of the novelties introduced serve to overcome shortages of import commodities. More attention is to be paid this year to co-ordination of publicly-owned and private factories, with a view to cost economies.

West German Progress

In western Germany the recovery noted in the autumn months has continued into the new year and the surplus stocks accumulated last summer have been mostly disposed of. In some sectors of the chemical industry, however, output at the end of 1949 was still below the 1948 peak, notably in the plastics trade, which is now reported to be meeting all domestic demands. Production of phenol is still not quite adequate, but the methanol output has risen substantially and will leave a surplus available for export.

Continued expansion of domestic production will permit substantial cuts in imports. A temporary import ban has been imposed on a number of commodities of which adequate stocks are said to be available, including aluminium, copper, zinc, antimony, tin, lime arsenate, arsenic, glycerine vegetable oils, lubricants, lacquers, varnishes and talcum for use in insecticides. Imports of nitrogenous fertilisers and superphosphates are to cease this year.

The liberalisation of inter-European trade is likely to result in an increase in imports of semi-finished and finished products, but German chemical manufacturers hope to derive more benefit in foreign countries from such a move than foreign suppliers in the German market. Trade with Japan is to be resumed under a recently concluded trade agreement; the principal German export item of chemical interest will be potash.

Following the closing of the two Fisher-Tropsche plants at Castrop-Rauxel and Wanne-Eickel on January 1, Ruhrchemie AG has discontinued the production of catalysts for the synthetic oil plants at the Oberhausen-Holten works; plans have been drawn up for the starting of alternative production schemes in the catalyst factory. Orders have been issued by the U.S. authorities for the dismantling of the magnesium works of Wintershall AG at Heringen, Hesse, which have been idle for some considerable time.

Germany's leading rayon producer, Vereinigte Glanzstoff-Fabriken AG, has now published its accounts for the first three postwar years and shows an increased turnover during the past two years. The company has drawn up a long-term maintenance and investment programme which it has already begun to put into effect. Its main items are modernisation of the rayon plant at Oberbruch and erection of a commercial-scale nylon plant. This would seem to prove that the experimental work at the nylon pilot plant at Oberburg has progressed satisfactorily.

PETROLEUM RESOURCES

THE recent proposal of the economic authorities of the Federal German Republic to abolish the rationing of petrol as from February 1, and to reopen the German market to foreign oil companies, has come as a surprise both to German and to foreign observers. German output of crude oil last year—of 841,500 metric tons; about 32 per cent more than in 1948—covered only one-third of requirements. The balance has been imported through the "Government Army Relief in Occupied Area"; that is to say it has been a gift from abroad.

The winning of oil on a commercial basis is a relatively new branch of the German economy. At the beginning of the 'thirties, four small oilfields in the Hanover area yielded 200,000 metric tons, equivalent to about 5 per cent of requirements at that time. When the Nazi régime, as part of its preparations for war, provided subsidies for a systematic oil search, the number of wells completed and the total length drilled trebled within five years. Only 5 per cent of them proved to be producers and this ratio remains unchanged to-day.

The Emsland Fields

The second world war brought a powerful stimulus to the German oil industry and a total of one million metric tons—the highest figure recorded—was won in 1940. Most of it came from Hanover, Hildesheim and Celle and part of Schleswig-Holstein. Searching for natural gas, German geologists discovered the Emsland oilfields, situated in the vicinity of the frontier with Holland, the major importance of which was evidenced by the raising of 114,000 tons of oil in 1947. The following table, which gives output figures for the four main producing regions of Western Germany, shows that output in the Emsland doubled between 1948 and 1949.

	1949 (*metric*	1948 *tons*)
Emsland	324,940	167,847
Hanover	412,646	370,086
Schleswig-Holstein ...	98,024	91,267
Baden	5,901	6,040
W. Germany, total ...	841,511	635,240

Recent investigations indicate that reserves in the Emsland oilfields are 15-20 million tons; combined reserves of all the other known oil-producing areas are thought to be only 3 million tons.

German oil experts hope to increase total output to 1.1 million tons in the current year and to 1.3 million tons in 1951. The share of the Emsland in this total should be 45 and 50 per cent.

Imports by the Federal German Republic in 1949 have required about 2 million tons, over one-half of which was of crude oil.

Metals and Coal in the West

WITH the exception of the aluminium and related metal industries, production from the non-ferrous mines and smelters in North Rhine-Westphalia is reported to be on the increase.

The coal industry is stated by the *Monthly Report of the Control Commission for Germany* (*British Element*) (4, No. 11) to be making good progress in Western Germany. The daily production of hard coal in North Rhine-Westphalia on two occasions last year exceeded 368,500 tons.

The programme of industrial explosives manufacture in the Land for November was 1670 tons, of which 866 tons was for the coal mining industry. The processing of pyrites cinders at Duisburger Kupferhütte has reached the pre-war maximum output of approximately one million tons a year.

It is reported that in 1949 over 200,000 tons of superphosphate were imported and plants in the Land have been unable to manufacture at more than some 60 per cent of capacity. The decision to cease imports is therefore welcomed by fertiliser producers.

Production of staple fibre for the textiles industry has reached a record figure of 3732 tons a month. The most notable increase has been in the output of rayon staple fibre, which advanced from 6590 tons in September to 7660 tons in October, 1949. West German synthetic fibres are dearer than the general European price level.

◆ HOME ◆

Chemists and Druggists

At the January examinations of the Pharmaceutical Society, 35 candidates qualified as chemists and druggists (22 men and 13 women).

Chemical Production Index

The provisional index of industrial production by the chemical and allied trades in October last was 131, 17 points higher than the monthly average for the three preceding months.

Search for Oil in the North-West

Latest methods of instrument prospecting are being used in a renewed search for oil in the North-west. A survey part of the D'Arcy Exploration Company, a subsidiary of the Anglo-Iranian Oil Company, began working last week along the shore between the Mersey and the Ribble.

£60,000 for Sugar Plant

Blake-Barclay & Co., the Greenock engineers, hope shortly to complete negotiations for a £60,000 contract for machinery for a new sugar refinery to be erected at Beirut, Syria. The company recently completed a £40,000 contract for this type of machinery for Hong Kong.

Iron, Steel and N-F Metals Exports

Iron and steel exports rose by 14 per cent in the fourth quarter of 1949, the volume for the year being 16 per cent above the 1948 average. The volume of non-ferrous metals exported in 1949 was 10 per cent above 1948, or 255 per cent of the 1938 volume. (*Board of Trade Journal, 158,* 236).

Glasgow Firm to Use U.S. Patent

Alley & McLellan, Ltd., compressor manufacturers, of Polmadie, Glasgow, are completing an arrangement with Dresser Industries of America and their subsidiary, Clarke Bros., of Olean, New York State, which will enable the Scottish firm to manufacture, under licence in Glasgow, the latters' special oilfield type of gas compressor. Very substantial orders for this plant are said to be available.

Lanarkshire Coal Project Uneconomic

The plan to create a coal distillation industry in Lanarkshire has been vetoed by the Secretary of State for Scotland on the finding by the Scottish Council (Development and Industry) that it is unlikely to prove economic. This information is contained in a statement, confirming earlier news, which claims that neither the volume nor type of coal required is obtainable in the area.

Manchester Building Exhibition

THE CHEMICAL AGE will be represented on the stand of Benn Brothers, Ltd. (No. 8) at the Building Trades Exhibition to be held in the City Hall, Deansgate, Manchester, from April 18-29.

Small Increase of Chemical Values

The rise of the chemicals and oils price index in 1949—1.7 per cent—was smaller than that of any other commodity group of the index except coal, states the *Board of Trade Journal.*

Prices of Oils and Fats

The Ministry of Food announces that no changes will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four-week period ending March 4, 1950.

Fall in Coal Output

Deep-mined coal production last week totalled 4,088,300 tons, a drop of 41,500 tons from the week before. Total coal production for the first five weeks of 1950 amounted to 21,281,400 tons, compared with 20,816,600 tons in the corresponding period of 1949.

New £5m. Atomic Plant

Architects and atomic experts are putting final touches to the Ministry of Supply's plans for the £5 million atomic plant at Capenhurst, four miles from Ellesmere Port. Initial construction work may start late in June, but the actual scheme will possibly require three years to complete.

KID Exemptions

The Treasury has made an order exempting the following articles from Key Industry Duty for the period beginning February 9 and ending June 30, 1950: isobutyl alcohol, tertbutyl alcohol, cocaine hydrochloride, cyclohexanol, deca-hydronaphthalene (a hydro naphthalene), diethyl p-nitrophenyl thiophosphate (an ethyl ester), methyl cyclohexanol, methyl cyclohexanone, methylene dichloride.

Praise for Steel Workers

Sir Ellis Hunter, president of the British Iron and Steel Federation has sent a message of congratulation to all steel ingot producers—managements and men—on the excellent start made in the new year. Output for January reached 15.873 million tons, the highest figure ever achieved in this month. In the last week of the month 328,100 tons were produced.

Next Week's Events

MONDAY, FEBRUARY 13

The Royal Institute of Chemistry

Leeds: University, 6 p.m. Prof. W. Bradley: " Chemistry and Medicine."

Institute of Metals

Glasgow: 39 Elmbrook Crescent, 6.30 p.m. (Scottish Local Section). E. J. Bradbury: "The Fabrication of Nickel Alloys."

Institute of Packaging

Manchester: Grand Hotel, 6 p.m. J. J. Cheesman: " The Use of Tensional Steel Strapping in Packaging."

TUESDAY, FEBRUARY 14

Society of Chemical Industry

London: 26 Portland Place, W.1, 6.30 p.m. Dr. K. W. Pepper (Chemical Research Laboratory, DSIR): " Recent Developments in Ion-exchange Resins."

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1., 5.30 p.m. " Conference on The Formation and Properties of Gas Bubbles."

Incorporated Plant Engineers

Manchester: Engineers' Club, Albert Square, 7.15 p.m. " Industrial Insulation."

Hull Chemical and Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. W. H. Bird: " Pattern For Progress."

Institute of Metals

Swansea: University College, Singleton Park, 6.30 p.m. (South Wales Local Section). Annual general meeting. L. G. Beresford: " Technical Journalism and the Metallurgist."

The Polytechnic

London: Regent Street, W.1, 7.15 p.m. First of series of four lectures. Claud Diamond: " Advances in the Science and Technology of Synthetic Fibres."

WEDNESDAW, FEBRUARY 15

The Royal Institute of Chemistry

London: 30 Russell Square, W.C.1, 6 p.m. (With BAC). T. McLachlan: "The Public Analyst and His Work."

The Royal Society

London: Burlington House, Piccadilly, W.1, 2.15 p.m. Discussion: " The Mode of Action of Local Hormones," opened by J. H. Burn.

Institute of Fuel

Manchester: Engineers' Club, Albert Square, 2 p.m. Walter Goldstern: " The Practical Value of Steam Storage."

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. R. W. N. Danielson: " Hot Pressing of Brasses."

Society of Instrument Technology

Manchester: Reynolds Hall, College of Technology, 7.30 p.m. J. Blears: " The Mass Spectrometer."

Institution of Works Managers

Stockton-on-Tees: Vane Arms Hotel, 7.30 p.m. Film: " Mechanical Handling."

THURSDAY, FEBRUARY 16

The Chemical Society

London: Institution of Mechanical Engineers, Storey's Gate, S.W.1, 7.15 p.m. Pedler lecture. Prof. J. W. Cook: "Polycyclic Aromatic Hydrocarbons."

Aberdeen: Marischal College, 7.30 p.m. (With RIC and SCI). Dr. James Taylor: " Applications of Exothermic Solid Reactions to Jet Propulsion and Industrial Purposes."

Manchester: University, 6.30 p.m. Reading of original papers.

Society of Dyers and Colourists

Leek: (with Leek Textile Society). H. A. Thomas (Courtaulds, Ltd.): " The Dyeing of Narrow Fabrics."

Incorporated Plant Engineers

Liverpool: Radiant House, Bold Street, 7 p.m. F. Latimer: " The Metallurgist and the Plant Engineer."

FRIDAY, FEBRUARY 17

The Chemical Society

Southampton: University College, 5 p.m. (with Southampton University College Chemical Society). R. S. Nyholm: " Modern Inorganic Stereochemistry."

Society of Dyers and Colourists

Manchester: Gas Department showrooms, Town Hall Extension, 6.30 p.m. " Targets for the Dyestuff Manufacturer."

Oil and Colour Chemists' Association

Birmingham: Chamber of Commerce, New Street, 6.30 p.m. Dr. P. D. Ritchie: " Some Aspects of Copolymerisation."

SATURDAY, FEBRUARY 18

Institution of Chemical Engineers

Manchester: Reynolds Hall, College of Technology, 3 p.m. N. Tetlow: " A Survey of Present Day Pumping Practice in the Chemical Industry."

• OVERSEAS •

Netherlands Streptomycin

Streptomycin is to be manufactured in Holland with the co-operation of a U.S. concern, according to a recent report in *Chemical and Engineering News*. The site will be in Gorichem, where a disused sugar factory is to be converted to a biochemical plant.

U.S. Sulphur Tonnage

Production of native sulphur in the U.S.A. in November totalled 400,564 long tons, a slight increase over the figures for the previous month. Output for the first 11 months of 1949 was 4,852,859 long tons, 78,825 long tons less than the same period of 1948. Producers' stocks have increased by 18,534 long tons to 3,115,865.

Venezuelan Oil Output

Crude oil output in Venezuela during the first nine months of 1949 amounted to 55.65 million cu. m., compared with 57.84 million cu. m. in the same period of 1948. Exports of crude fell to 49.15 million cu. m. from 52.54 million cu. m. Shipments of petroleum derivatives, however, were slightly higher at 3.85 million cu. m. against 3.64 million cu. m.

German Chemical Assets

The Swiss Government is to offer for sale the total share capital (600 shares with a nominal value of Sw. fr. 500 each) of the German-owned Chemisch - Technische Werke AG, of Muttenz, which manufactures asphalt, mineral oils, bitumens, insecticides, etc. The conditions of sale can be obtained from the Swiss Compensation Office, Tabstrasse 62, Zurich, and offers should be submitted before February 28.

Aluminium to Save Dollars

The recommendation that Western Europe should produce and consume more aluminium to save dollars on other metals and materials has been made by the non-ferrous metals committee of the OEEC. The 1952-53 estimated consumption of 508,000 tons is considered too low, according to the committee's report, which forecasts production during the same period as 381,000 tons. In 1955, consumption might be increased to over 650,000 tons and production to 462,000 tons with the help of overseas territories.

Six Chemical Plants for Poland

According to *Przemysl Chemiczny*, Poland's chemical industry will receive from the Soviet Union six complete chemical units in furtherance of the six-year plan. They are a carbide factory, an acetic acid plant, a unit for the manufacture of nitrogen compounds, a soda plant, a factory for the production of sulphuric acid from gypsum, and a plant for the manufacture of synthetic phenol.

Monsanto Sales Nearly $166 Million

Sales of the (U.S.) Monsanto Chemical Company in 1949 were $165,924,000, an increase of $4,315,259 over the sales for 1948. Sales for the fourth quarter of 1949, excluding those of the British and Australian affiliates, amounted to $44,552,559.

U.S. Cottonseed Oil for Germany

More than 450 tank cars of crude cottonseed oil are being concentrated in Houston, Texas, for export shipment to Germany under the Marshall Plan. Derived from Government-owned cottonseed, the shipment will total 18,000 metric tons of crude oil.

Crystallography Congress

The second general assembly and international congress of the International Union of Crystallography will be held from June 27-July 3, 1951, in Stockholm, at the invitation of the Swedish National Committee for Crystallography. By giving ample notice it is hoped that as many crystallographers as possible will be able to make arrangements to attend.

Canada's Domestic Stainless Steel

The installation of Canada's first stainless steel sheet rolling mills has been started by Atlas Steels, Ltd., at its works in Welland, Ontario. Production should begin in September and is expected to free Canada from dependence on imports from the U.S.A. and Britain. The U.S.A. has been supplying 90 per cent of Canada's annual requirements of 2750 tons.

Indian Lac Research

An Indian institute has perfected methods of making shellac by use of an autoclave. The new method eliminates the use of both shellac cloth and charcoal, and requires less labour. The method, which reduces cost of production by about 10 per cent, has been perfected on a laboratory scale, and successfully tried with small-scale pilot plant. New compounds made out of linseed oil and tobacco oil at the institute have been found to give lac good gloss, water resistance and satisfactory adhesive qualities.

ACID PLANT FOR ATHENS

Notable British Contract

A CONTRACT, exceeding £250,000 in value, for a large contact sulphuric acid plant to be supplied to the Hellenic Company of Chemical Products and Fertilisers, Ltd., Athens, was recently secured by the Stockport chemical engineering firm of Simon Carves, Ltd., in competition with Belgian, German and U.S. firms (THE CHEMICAL AGE *62*, 139).

A description from the technologists concerned indicates that this plant is designed for the production of 150 tons equivalent of 100 per cent H_2SO_4 per day as 94 per cent acid, and 30 per cent oleum. The raw material will be Cassandra pyrites with approximately 48 per cent available sulphur, which will be roasted in flash roasting equipments of Nichols-Freeman design, into which the finely ground dried pyrites is injected with preheated air.

The roaster auxiliary equipment comprises pyrites handling by shovel, feeding to the boot of an elevator which delivers to an overhead steel bunker for service storage of the raw pyrites. A variable belt feeder takes the moist pyrites to a dryer, from which the dry pyrites is then conveyed to the dry pyrites bunker.

Pulverising

A ball mill treats the dry pyrites, reducing it to dust, the system being a closed circuit with classifier and cyclone. The finely ground pyrites is lifted to the ground pyrites bunker, from which the product is automatically fed to the main air stream for injection to the roaster.

Combustion takes place at high efficiency, resulting in an exit cinder containing not more than one per cent sulphur. The cinders are conveyed away from the numerous off-take chutes by water-cooled, push-pull conveyors, for subsequent disposal.

The roaster is followed by a waste heat boiler producing steam, which will be employed for power generation in a turbo-alternator. Up to 1½ tons of steam can be generated per ton of pyrites roasted, and the steam will be superheated in superheaters provided with the waste heat boiler and in the converters.

The dust is removed from the gas stream by cyclones and electrostatic precipitators of standard Simon-Carves design, provided with Ferranti/Simon-Carves shockproof high tension equipment and switchgear. Leaving the dust precipitators, the gas passes to the cooling and purification plant, comprising cooling tower with weak acid recirculation and cooling system, for the removal of arsenic and residual dust. From the coolers the gas goes on to the Simon-Carves electrostatic mist precipitators before entering the drying tower, which is under suction from the blower.

All water is removed at this stage and the cold dry gas is blown forward to the oxidation unit of standard Monsanto/Simon-Carves design, comprising converter and heat exchangers. Absorber and oleum tower are provided with the customary auxiliary strong acid recirculation and cooling equipment.

A large part of the plant is in the open, but buildings will be provided to house the blowers and instrument panel, the furnaces, boilers, dust precipitators and rectifiers.

(*continued at foot of next column*)

LABORATORY GLASSWARE

Avoiding Centrifugal Breakdown

ORDINARY commercial glassware is not always able to stand up to the high stresses frequently set up in centrifuging machines. The causes of such failure have been the object of special study by Measuring and Scientific Equipment, Ltd., London, and a guaranteed centrifuge-tested glass has now been produced.

It is stated that all the tubing used is specially selected, of uniform wall thickness, free from striae and other irregularities and inspected to a specification developed in co-operation with the British Medical Research Council.

During manufacture uniform wall thickness is maintained, all ends being ground and fire polished. Care is taken to see that the annealing is carried out efficiently, and all tubes are tested for strain by polarised light and re-checked for uniform wall thickness.

In each batch, 5 per cent is tested centrifugally at an RCF equal to the maximum required for that particular type of tube when using MSE machines and using a fluid of specific gravity 1.2.

Two qualities of this glassware are available, soda glass and heat resisting. This specially made and selected glassware is slightly more expensive than the ordinary commercial type.

The Stock and Chemical Markets

BUSINESS in stock markets has further declined and was affected earlier in the week by a reaction in British Funds, following dealings in the new Southern Rhodesia loan. The premium on this was only 5s., although £1 had been generally expected a week ago.

Industrial shares showed a majority of small declines, but movements generally have not exceeded more than a few pence. Attention drawn to the chemical industry's plans for expansion helped to keep chemical shares steady. Nevertheless, as in most other sections, buyers have continued to hold off until the General Election result.

Imperial Chemical again changed hands around 41s. 3d., reflecting continued confidence that the 10 per cent dividend is likely to be maintained and the assumption that when more capital is required, shareholders are likely to have preferential terms of allotment. Albright & Wilson remained around 29s. Laporte Chemicals 5s. ordinary were still around 9s. 6d., further expansion of the company's business being expected. Monsanto 5s. ordinary were 50s. 9d., and Brotherton 10s. shares remained at 19s. 3d. Amber Chemical 2s. shares were 4s. 9d., F. W. Berk 14s. 3d., and Boake Roberts 5s. shares 25s. 6d.

Bowman Chemical 4s. shares stayed at 5s. 3d., Pest Control 5s. ordinary were 7s. 9d., and Thomas Tilling moved up to 23s. following the deal whereby the company has purchased from Pilkington Brothers for over £1 million a 60 per cent interest in James A. Jobling. Triplex Glass have been steady around 18s., helped by the news of growth of the company's export business. British Glues 4s. shares further improved to 20s. 3d.

There has been a better trend in Lever & Unilever following their recent set-back, the price improving moderately to 40s. 3d., while Lever N.V. were 41s. British Aluminium held their improvement to 40s. and British Oxygen were higher at 92s. 3d., but Borax Consolidated (55s.) have not recovered from an earlier reaction. United Molasses at 39s. 6d. were easier, profit-taking following an earlier rise.

British Xylonite, at 57s. 6d., have been steady, while De La Rue were 23s., and British Industrial Plastics 2s. shares at 4s. 6d. have been firm. Elsewhere, Associated Cement further eased to 78s. 3d., but a number of paint shares became firmer, Lewis Berger being 25s. 1½d. Pinchin Johnson have changed hands around 36s. 3d. Fisons have come back sharply to 24s. because of the chairman's hint of new capital plans, although it is realised that more capital is unlikely to be raised until later in the year.

Boots Drug have strengthened from 47s. 6d. to 48s., and the 4s. units of the Distillers Co. showed firmness at 17s. 6d. Oils were firmer, there being hope of a compromise on the decision to " cut " oil imports from the dollar countries. Shell were 65s., Anglo-Iranian £6 11/16, and Trinidad Leaseholds 21s. 9d.

Market Reports

ACTIVITY on the industrial chemicals market continues to be well maintained and contract deliveries to consumers, particularly the textile and plastics industries, have covered good volumes. Buyers are having no difficulty placing new business for spot or nearby delivery and this applies to most sections of the market. The de-control of sulphuric acid distribution is not expected to have much effect on consumption. The product is still price controlled and high haulage charges will probably operate against long distance deliveries. The volume of inquiry for shipment is again satisfactory. With regard to the coal tar products there has been a good call for pitch, with fair quantities being shipped to the continent. Offers of naphthalene are quickly taken up and there is an active market in the light distillates. The demand for creosote oil is quietly steady and a fair export business to U.S.A. has been reported.

MANCHESTER.—Good deliveries of the alkalis and other leading chemical products are being taken up by the textile and allied trades and other consumers, while a steady flow of replacement business covering a fairly wide range has been reported on the Manchester market during the past week. This has included both home-trade orders and export buying. Little important change in the price position has occurred and the undertone of the market is strong in almost all sections. Superphosphates and certain other fertiliser materials have been rather more active. A fairly steady movement of supplies is reported in the tar products market.

GLASGOW.—Turnover in the Scottish chemical market has generally attained

(*continued on page* 244)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have bean reduced.)

Lafarge Aluminous Cement Co., Ltd., London, W. (M., 11/2/50.) Order of Court dated December 14, 1949, amending particulars relating to supplemental trust deed dated March 25, 1949, and reg. April 11, 1949, by substituting the word "nil" for the figure of £25,000. (This figure is that given in the original particulars as being the amount of deb. stock then issued); also December 22, £25,000 first deb. stock part of an amount already reg. *£138,890. Nov. 3, 1949.

Sheppy Glue & Chemical Works, Ltd., Horley. (M., 11/2/50.) December 30, deb., to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *£14,880. April 14, 1949.

Satisfaction

Evans Medical Supplies, Ltd. (formerly Evans Sons Lescher & Webb, Ltd.), Liverpool. (M.S., 11/2//50.) Satisfaction January 11, of deb. stock reg. March 12, 1943, to the extent of £12,000.

New Registrations

Bowdler and Bickerdike, Ltd.

Private company. (477,670). Capital £10,000. Manufacturers of chemicals and chemical preparations, cements, oils, paints, etc. Directors: H. E. J. Cory and C. Cory. Reg. office: Eagle Chemical Works, Church, nr. Accrington.

Isotope Developments, Ltd.

Private company. (477,928). Capital £25,000. Objects: to develop and turn to account the use of radioactivity and the use of radioactive and stable isotopes and radiations which are emitted or caused by them, etc. Solicitors: Slaughter and May, 18 Austin Friars, E.C.2.

R. V. Jones, Ltd.

Private company. (477,748). Capital £2000 in £1 shares. Manufacturers of chemical engineering plant. Directors: R. V. Jones, D. J. Jones, J. D. W. Jones. Reg. office: 521 Kingsbury Road, N.W.9.

P.C. Products (Overseas), Ltd.

Private company. (477,777). Capital £100. Manufacturers of chemicals and chemical products. Directors: J. Benjamin, M. E. Stiller. Reg. office: 110 Stainbeck Lane, Leeds, 7.

South Western Detergents, Ltd.

Private company. (477,782). Capital £2000. Manufacturers of detergents, cleansing materials and compounds, soap, etc. Directors: W. G. Macnamara and A. R. Macnamara. Reg. office: Central House, 9 Exeter Road, Exmouth.

Company News

Pest Control, Ltd.

At the first annual general meeting of the company it was made known that profits for the year ended September 30, 1949, were £100,045—nearly twice the 1948 total. A resolution was passed increasing the capital of the company to £1.25 million by the creation of one million 5s. ordinary shares. The Treasury's consent was awaited for the creation of £500,000 seven-year 5 per cent secured stock, of which £300,000 is to be issued for cash at par.

Increase of Capital

The following increase in registered capital has been announced: Scott and Bowne, Ltd., from £120,000 to £250,000.

THE STOCK AND CHEMICAL MARKETS

(*continued from page 243*)

normal levels. In general, the supply position is being well maintained and prices are reasonably stable, despite one or two increases and a few small decreases. There is still a very considerable shortage of coal tar products, particularly xylol, which is holding up production in a number of factories. The export market has been much more active than for some time and a number of orders have been booked for shipment to Europe.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Plasticised synthetic resin compositions.—G. L. Martin Co. July 26 1948. 633,939.

Heat-resistant alloys.—G. R. Shepherd. (Westinghouse Electric International Co.). Aug. 23 1946. 633,883.

Process and apparatus for making carbon black.—A. H. Stevens. (G. L. Cabot, Inc.). Oct. 29 1946. 633,945.

Process for obtaining insecticide substances in a high grade of dispersion or pulverisation, through the incorporation of carbon dioxide.—C. R. Pla. Nov. 27 1945. 633,844.

Rubber derivatives and processes for their production.—Dunlop Rubber Co., Ltd., F. A. Jones, and G. A. Truesdale. Nov. 22 1946. 633,846.

Manufacture of siloxane resins.—Dow Corning Corporation. Jan. 21 1946. 633,849.

Method of producing higher molecular weight alcohols.—Soc. Anon. d'Innovations Chimiques Sinnovia Ou Sadic. June 28 1946. 633,864.

Processes of producing agglomerated sodium hexametaphosphate and the product resulting therefrom. — Monsanto Chemical Co. June 7 1946. 633,952.

Isoquinoline derivatives.—Kodak, Ltd. April 19 1946. 633,874.

Synthetic resinous materials.—British Thomson-Houston Co., Ltd. April 30 1946. 633,876.

Production of oil from oil-bearing protein material of animal origin.—General Foods Corporation. May 26 1942. 633,953.

Manufacture of alkali metal cyanides.—W. H. Groombridge, and W. Hunter. May 8 1947. 633,882.

Emulsions for combating noxious organisms.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 20 1945. 633,885.

Calcium phosphate phosphors.—British Thomson-Houston Co., Ltd. July 15 1946. 633,891.

Preparation of derivatives of cyclohexene.—Glaxo Laboratories, Ltd., Sir I. M. Heilbron, and E. R. H. Jones. July 16 1947. 633,892.

Preparation of ketonic derivatives of cyclohexene.—Glaxo Laboratories, Ltd., Sir I. M. Heilbron, and E. R. H. Jones. July 16 1947. 633,893.

Manufacture of hydrogen peroxide.—H. E. Alcock. July 22 1947. 633,782.

Process for the manufacture of calcium-salts of phosphorylated arabonic acid and derivatives thereof.—Roche Products, Ltd. March 30 1945. 633,967.

Process for the preparation of concentrated rubber dispersions.—Nederlandsch-Indisch Instituut Voor Rubberonderzoek. Aug. 14 1946. 633,904.

Stabilisation of polysulphone synthetic resins.—British Celanese, Ltd. Aug. 13 1946. 633,786.

Apparatus for separating grease, oils and fats from waste water. R. H. Newman, and M. P. Hirshstein. Oct. 4 1938. 633,905.

Preparations comprising esters of arylcarbamic acids.—I.C.I., Ltd., and F. Dawson. Aug. 25 1947. 633,970.

Preparation of alkynyl-alkenyl-carbinols.—I. M. Heilbron, and E. R. H. Jones. Sept. 26 1947. 633,772.

Organo - polysiloxane compositions.—Westinghouse Electric International Co. Oct. 30 1946. 633,973.

Preparation of chlorinated dinitrobenzenes.—Glaxo Laboratories, Ltd., E. T. Borrows, and J. C. Clayton. Oct. 28 1947. 633,977.

Preparation of seaweed for industrial purposes.—J. A. Kelly. Dec. 24 1946. 633,798.

Recovery of alcohols from mixtures containing same.—Shell Refining & Marketing Co., Ltd., and P. J. Garner. Oct. 28 1947. 633,979.

Process for making sorbic acid esters.—Carbide & Carbon Chemicals Corporation. Nov. 5 1946. 633,800.

Process for the manufacture of N-disubstituted-aminoalkyl diaryl-chloro-thioacetates and derivatives thereof.—Roche Products, Ltd., A. L. Morrison, and M. Konigstein. Nov. 18 1947. 633,922.

Production of water-insoluble threads or like products of cyanoethyl ethers of cellulose.—Courtaulds, Ltd., J. H. MacGregor, and C. Pugh. Dec. 1 1947. 633,807.

Catalytic aromatic alkylation processes.—Anglo-Iranian Oil Co., Ltd., and J. Habeshaw. Dec. 6 1947. 633,985.

Manufacture of resins from aldehydes and aromatic hydrocarbons.—Dorman, Long & Co., Ltd., T. G. Woolhouse, and W. Lunn. Dec. 16 1947. 633,923.

Process for the manufacture of maleic anhydride.—Beck, Coller & Co. (England), Ltd. Aug. 25 1947. 633,814.

Moulding plastic materials by extrusion. —R. Colombo. Feb. 5 1940. 634,071.

Distilling bituminous material to make coke.—A. H. Stevens. (Pittsburgh Coal Carbonisation Co.) Nov. 1 1945. 634,150.

Poly-N-vinyl pyrrole compounds moulding composition and process.—General Aniline & Film Corporation. Feb. 2 1945. 634,077.

Process for the recovery of ammonia from ammonia-containing gas.—Koppers Co., Inc. Nov. 8 1945. 634,153.

Hydrogenolysis of 2-alkyl substituted furans.—I.C.I., Ltd., J. G. M. Bremner, D. G. Jones, and R. R. Coats. March 28 1947. 634,080.

Hydrogenation of cyclic organic compounds.—I.C.I., Ltd., J. G. M. Bremner, and F. Starkey. July 7 1947. 634,089.

Process of preparing selenium to which is added small quantities of substances for the purpose of increasing its conductivity. —N.V. Philips' Gloeilampenfabrieken. Sept. 27 1946. 634,167.

Copper catalysts.—I.C.I., Ltd., P. W. Reynolds, and J. W. Donaldson. Oct. 1 1947. 634,097.

Process for carrying out vapour phase chemical reactions in the presence of a suspended catalyst.—J. C. Arnold. (Standard Oil Development Co.) Nov. 19 1946. 634,102.

Polyamide condensation polymers.—Wingfoot Corporation. Nov. 21 1946. 634,172.

Insecticidal composition.—S. G. Dehn. (Stauffer Chemical Co.) Dec. 17 1946. 634,175.

Process for the manufacture of a detergent product as a substitute for soap.—J. De La V. Samper. Jan. 18 1947. 634,179.

Methods of making insulators and ceramic compositions.—C. E. Every. (Titanium Alloy Manufacturing Co.) Jan. 23 1947. 634,181.

Manufacture of silica gel-containing catalysts.—J. C. Arnold. (Standard Oil Development Co.) Jan. 28 1947. 634,182.

Esters of polyoxyalkylene diols and methods of making such esters.—Carbide & Carbon Chemicals Corporation. Feb. 26 1946. 634,183.

Production of fluoroacetic acids and derivatives thereof.—I.C.I., Ltd., J. W. C. Crawford, and E. R. Wallsgrove. Feb. 16 1948. 634,188.

Manufacture of silver and bismuth nitrates.—Johnson & Sons' Smelting Works, Ltd., and T. Critchley. Feb. 4 1948. 634,189.

Method of reducing the formation of foam in liquids and preparations therefor. —Ciba, Ltd. April 1 1947. 634,197.

Process for the catalytic hydroxylation of olefinic compounds.—N.V. De Bataafsche Petroleum Maatschappij. April 10 1947. 634,118.

Processes of preparing polyvinyl acetate emulsions.—A. H. Stevens. (Shawinigan Resins Corporation.) March 12 1948. 634,216.

Process and apparatus for the continuous crystallisation of tar oils, naphthalenic anthraenic and like oils.—Soc. Per Azioni Vetrocoke. June 10 1947. 634,225.

Method of producing synthetic, water-insoluable viscous liquid thermosetting resins, and the products resulting therefrom.—Quaker Oats Co. July 3 1947. 634,126.

Separation of delta-tocopherol from vegetable oils.—Distillation Products, Inc. July 7 1947. 634,128.

Process of producing a colloidal lead iodide.—A. Dinsley. July 17 1947. 634,233.

Polyamides.—E. I. Du Pont de Nemours & Co. July 21 1947. 634,235.

Pyridazone derivatives and method of preparing the same.—General Aniline & Film Corporation. July 25 1947., 634,236.

Production of dextran.—East Anglia Chemical Co., Ltd., A. R. Lockwood, and G. Swift. May 28 1948. 634,129.

Manufacture of asymmetrical urea derivatives of monoazo-dyestuffs.—Ciba, Ltd. Aug. 12, 1947. 634,130.

Process for the production of dichloropropylenes.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 17 1947. 634,137.

Production of hydrolysed ethylene interpolymers.—I.C.I., Ltd. Feb. 24 1948. 634,140.

Manufacture of an ester of nicotinic acid. —Ciba, Ltd. March 11 1948. 634,033.

Manufacture of acetaldol.—Usines De Melle. March 27 1945. 634,562.

Manufacture of aldols.—Usines De Melle. April 6 1945. 634,563.

Aluminium base alloys.—Trefileries et Laminoirs Du Havre, G. Chaudron, and J. Herenguel. Aug. 14 1945. 634,492.

Process for making dry starch preparations soluble in cold water.—N.V. W. A. Scholten's Chemische Fabrieken. May 3 1946. 634,368.

Modified resin compositions.—L. Berger & Sons, Ltd. June 3 1946. 634,570.

Process for the preparation of 2: 4-dichloro-1-amino-anthraquinone. — S. G. Bedekar, and K. Venkataraman. Aug. 26 1946. 634,646.

Polymerisation in aqueous dispersion of polymerisable organic compounds.—B. F. Goodrich Co. Sept. 5 1946. 634,647.

Glass-to-metal seals.—British Thomson-Houston Co., Ltd., and W. J. Scott. July 27 1948. 634,657.

The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Training Chemical Engineers

THE present year gives promise of bringing more progress than any of its predecessors in the urgently needed expansion of training facilities for chemical engineers. The most remarkable thing in this connection is not so much that the long desired concentration of interests is now beginning to produce results as the unconscionably long time that was required to bring it about. The need for more men adequately trained in chemical engineering principles was conspicuous almost as soon as the conversion of industries to peacetime production got under way. The principal educational centres, faced with demands possibly of equal urgency from other quarters, have been slow in providing facilities. Cambridge University was more alert to the need than were most others; Manchester, where the need for chemical engineers is very much a local problem, is still without a Chair of Chemical Engineering.

Now that the neglected topic is receiving the attention it deserves the accumulated shortcomings of the past are exacting a penalty. As a preliminary to formulating an educational programme on a national scale it has been necessary to carry out a far-reaching investigation of basic needs and facilities. One of the more obvious preliminaries was to determine how many chemical engineers constitute the minimum needs of industry in the next few years. The Technical Personnel Committee of the Ministry of Labour, under the chairmanship of Lord Hankey, has been examining the present and future demand for professionally qualified chemical engineers and the report of this committee is one of those to be issued in the next group of publications on "The Present and Future Supply and Demand for Persons with Professional Qualifications."

One of the more encouraging factors in the gradual approach to a sufficiency of trained people is the active interest which has been displayed by the technical colleges. There the general objective has been the creation of chemical engineering courses of a non-degree character and the policy has derived useful stimulus from the Ministry of Education's recognition of the need to make chemical engineering studies available to the national certificate type of student. A welcome manifestation of that policy has been the establishment of a department of chemical engineering at the City and Guilds College.

These things are indicative of the

On Other Pages

Leader:

Training Chemical Engineers . . 247
Notes and Comments:
Enlightened View . . 249
Rubber Research . . 249
Simplification . . 249
Chemist's Tragedy . . 250
Progress of British Streptomycin . . 251
Paint Group Segregates Interests . . 252
Germany's Chemical Recovery . . 253
Declining Oil Production . . 255
Five-fold Increase of Rubber Latex Industry . . 256
Rubber in 1949 . . 256
Trade with Scandinavia . . 257
Pest Control Products . . 257
Norway's Export Totals . . 257
Reduced Stocks of N.-F. Metals . . 258
Basic Chemical Supplies . . 259
Belgian Chemical Industry . . 259
The Chemical Processing of Wood Waste . . 260
Drugs and Fine Chemicals in 1949—III . . 261
Fertiliser Experiments with Urea-Formaldehyde . . 263
Combined Manufacture of Cement and Chemicals . . 264
Triethyl Phosphate . . 266
Elements of Cooling Water Control—II . . 267
Portugal's Chemicals . . 270
The Technical Press . . 274
Ruling on Patents Claims . . 277

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changed attitude of the Government towards technologists. Due to the inadequate supply of young chemists and technologists from universities, colleges and polytechnics, large firms have been obliged to train their own staff—a policy which offers many advantages though it does perhaps tend towards narrow specialisation.

All such schemes, necessary as they are, fall short of the main target; but they indirectly serve the same purpose by providing staff to relieve the demand made upon the time of more highly qualified practitioners. They provide, in addition, a starting point from which the best candidates for further training may go on to join the attenuated ranks of the higher command.

An increasing number of universities fortunately have now seen the need to inaugurate courses in chemical engineering. Facilities for the higher training of post-graduates are being made available not only for those aspiring to the higher degrees, and specialising in research, but also for men who have gained the usual degrees and wish to extend their training. These courses are designed not only to give a graduate a wider knowledge of his special subject, but also to afford some training in other fields closely allied to his own. Thus the mechanical engineer with a degree might study mining and the chemist or physicist might be given a course in metallurgy. In this way the dangers of over-specialisation can be avoided or minimised, and for the chemical engineer these facilities should be especially valuable.

None of these factors, however, can disguise the fact that a considerable period must elapse before the shortage of chemical engineers can be finally disposed of. Buildings will have to be erected and equipped, and a much more difficult problem is presented by the limited number of qualified teachers likely to be available. In other fields of engineering a suitable proportion of the graduates have become attached to the staffs of universities or technical colleges; others have subsequently found their way back to the universities, bringiing with them the valuable asset of their industrial experience. Existing chairs are filled by men of the highest qualifications, but the very fact that chemical engineers have not hitherto been produced in sufficient numbers may result in a shortage of teachers when additional facilities have been established.

Notes and Comments

Enlightened View

NOTHING could be more welcome than evidence that trade union organisers at large had been convinced that the need for full and uninterrupted production outweighed some partisan policies which have been pursued in the past. The paucity of evidence of that kind makes doubly interesting the unorthodox faith represented in a special article in the current number of the *I.C.I. Magazine* by Mr. Alfred Stott. Mr. Stott, a shop steward in the Nobel Division of I.C.I., invites his fellow trade unionists to admit that the oppressive millowner of the past (top hatted, with whip in hand if the cartoons are any evidence) is at the moment about as serious a problem as is the dinosaur. He asks:—

> " Can a reconciliation between Boss and Worker be effected? If so, how can it be brought about? Certainly not by fear and suspicion, nor by prejudice or by conceding nothing. If we, the workers, were prepared to put something into the kitty, that would be an excellent send-off. To reconcile Boss and Worker we must form our works council and see that our representatives are kept up to scratch. Views can be aired and if there is something which to us, as workers, seems absurd and it is explained by those in authority, then many suspicions can be removed.
>
> " Then we come to the profit motive. What we really mean is profiteering. There is a tremendous difference between the two. Could any ordinary British workman be content at his job if he was working for a firm that did not make a profit? Does not a worker go to work in order to make a profit? "

Self-evident facts of this kind, it seems, can be appreciated by a shop steward but not by Cabinet Ministers.

Rubber Research

MUCH of the history of contemporary uses of rubber is being recalled by the current commemoration of 30 years' very active work by the Research Association of the British Rubber Manufacturers. When the Association might have been celebrating its silver jubilee its urgent wartime preoccupations with such things as substitutes for the synthetic Buna rubber which had been drawn from Germany and a host of similar demands presented by warfare in which rubber played at least as vital a part as did high explosives made celebrations impossible. In " Thirty Years of Rubber Research " the association's passing references to the themes and achievements of its investigations of such subjects as synthetic and silicone rubbers, sulphur, carbon blacks, organic accelerators and antioxidants, softeners and plasticity bring a fresh realisation of the relative novelty of much of the body of rubber science and technology—and of the vital contribution that it has made to everyday things. Confirmation of that was found in an industrial demonstration in London this week which recalled that a substance as familiar and useful as latex rubber is still relatively a newcomer. Both these surveys point unmistakably to the fact that the subject of rubber compounding and uses now calls for research on a much wider front than when the association made its tentative approach to co-operative industrial research, largely in the interests of tyre manufacturers, in 1920. The functions and qualities of carbon blacks would alone fill one large research programme.

Simplification

INSECTICIDES and like chemicals, whose names are scarcely pronounceable even by the specialists who produce them, usually acquire proprietary names which, although they can be articulated and memorised fairly easily, do not convey to the user the basic characteristics of the product. The efforts of a newly formed technical committee of the British Standards Institution to devise simple common names for pest control products should therefore receive the warm support of agriculturalists and no less of the interests which want to see the products popularised. The BSI has sensibly decided to give " the interested public " the opportunity to assist by suggesting names for established products or submitting information about new ones which require names. The makers of the new systemic insecticide did well to choose the crisp name. Pestox 3, to identify his (bis dimethylaminophosphonous) anhydride ($C_3H_{24}O_3N_4P_2$). But trade names are not the appropriate form for international documentation. The subject as a whole would seem a heaven-sent opportunity for the lover of acrostics to show his skill. The subject of simplification leads one irresistibly into other fields where complex names baffle the memory and invite the use of cryptic strings of initials. Perhaps someone could suggest an alternative name for the BSI's Technical Committee for Nomenclature of Pest Control Products, or for its Pest Control Products Industry Standards Committee?

Not So " Hot " Laboratories

THE radioactive by-products of atomic energy, " radioisotopes ", will play a great part in the future of many industries. The U.S.A. is the source of that forecast and the general approach to the subject there indicates that there are good reasons to expect that its realisation will not be long deferred. The U.S. Atomic Energy Commission is currently providing a liberal supply of information in the interests of industries, of which the most recent examples have been the papers presented before the American Society of Mechanical Engineers, by Paul Aebersold, head of the isotopes division, and others. The policy of educating industries to use radioactive isotopes with safety is manifested in the study of safe handling (G. G. Manov and D. G. Linz) which, while not minimising the destructive possibilities, strongly suggests that even high-energy radioactive tracer materials need present little more risk than some chemicals in the industrial research laboratories to which they have been made freely available in the U.S.A. This survey raises several reassuring factors, such, for example, as the computation that the curtailment of the life of anyone exposed to radioactive emission equivalent to 0.3 roentgen per week from the age of 21 until he was 70 might be no more than three months. Low dosage radiation, which even in an industrial laboratory can be rendered innocuous by simple screening with aluminium, cement or lead, according to the type of emission, has been the subject of experiments with animals. The American conclusion expresses the life curtailing factor between 21 and 70 as 7×10^{-3} years per roentgen, or about 2.5 hours per r. Assuming that all such calculations are soundly based and that full use is made of the highly developed screens and detectors, it would seem that the general laboratory use of radioactive substances might be no more hazardous than the universal rain of cosmic rays, to which mankind should by now be pretty well accustomed.

Chemist's Tragedy

TYPIFYING the host of private tragedies involved by the imposition of a Soviet regime in science is a news item received indirectly from Prague this week. It reveals that Dr. Jaroslav Kulhanek and his wife have committed suicide. Dr. Kulhanek was the first secretary general and co-founder of the Federation of Czechoslovakian Chemical Industries, the organisation founded in the new Czechoslovak Republic in 1918. He occupied that office until he retired in 1930, to be succeeded by his deputy, Dr. George Lewi. Dr. Lewi resigned in 1938 and came to this country. Since 1930, Dr. Kulhanek had practised as a solicitor in Prague and was an acknowledged expert on cartel and syndicate legislation. He took a prominent part in the activities of the Maison de la Chimie in Paris and was decorated with the Legion d'Honneur.

PROGRESS OF BRITISH STREPTOMYCIN

Increasing Quantities Being Exported

THE very large increase recently made in U.K. production of streptomycin has been reflected in the widening of the basis of distribution, permitting deliveries to be made to doctors and chemists. Until November 1 last year all supplies of the drug had to be sent, under instructions from the health authorities, to the various approved hospitals.

Shortage Overcome

The successful development of streptomycin production has been one of the most outstanding achievements in the pharmaceutical industry in Britain in post-war years, it was claimed last week by Glaxo Laboratories, Ltd. Even in that difficult period when the acute shortage of the drug necessitated BBC appeals for overseas supplies, laboratory investigation and limited production were going on in Britain. The position today is so drastically changed that not only can all home needs be supplied but gradually increasing quantities are being dispatched to hospitals and doctors overseas.

Glaxo Laboratories, Ltd., became interested in this potent antibiotic shortly after its discovery by the American mycologist, Dr. S. A. Waksman, in 1944. By the end of 1946 preliminary laboratory work was well in hand at the company's antibiotics plant at Barnard Castle, Co. Durham, and in the following year pilot plant production began. By the early part of 1948 the results from the pilot plant were so encouraging that several 5000-gal. fermenters, previously used for penicillin

Spray inoculation of a production batch of streptomycin

Operators minding instruments and logging performance details of fermenters at Ulverston, Cumberland. (Both illustrations by courtesy of Glaxo Laboratories, Ltd.)

fermentation, were taken over by the chemical engineers for conversion to streptomycin manufacture.

During the initial stages of manufacture a research team worked alongside the production staffs, and this close scientific watch on events led to several important modifications being incorporated in the extraction process. Breakdowns were not infrequent in the early experimental days, and in order to reduce engineering delays to a minimum a team of engineers was standing-by night and day so that defects could be rectified as they occurred. The award in the King's Birthday Honours List last year of the B.E.M. to Mr. Harold Barron, a senior charge-hand in control of the streptomycin engineering force at Barnard Castle, was a recognition of this work.

Similar Processes

Many of the manufacturing processes follow the same pattern as of penicillin, and part of the penicillin equipment at both Barnard Castle and Ulverston is economically utilised in streptomycin production. Up to and including the fermentation stage the processes are identical. Streptomycin production begins in the " spore form," where microbiological preparation of streptomycin cultures is carried on alongside penicillin. The inoculum is grown in a one-litre shake flask and passes through a series of tanks of gradually increasing size—initially the 50 and 500 gal. units and finally large 5000 gal. fermenters for large-scale fermentation.

Streptomyces griseus, the micro-organism which produces this antibiotic, grows best on a rich protein diet (*e.g.*, meat extract) instead of the relatively inexpensive corn steep liquors used in penicillin production. One of the microbiological problems involved in streptomycin has been the production of a more economical, and at the same time more nutritive, medium.

When the fermentation stages are complete, filtering of the broth removes the mycelium and unwanted solids. The mycelium from streptomycin, unlike that of penicillin, is like thin tissue paper. Streptomycin is extracted by an adsorption process—where it differs radically from penicillin—and is converted to crude hydrochloride. This is in turn converted by a crystallisation process to calcium chloride salt. The calcium chloride is decolorised, Seitz-filtered and freeze-dried in bulk.

To ensure continuous laboratory supervision, routine control of the fermentation and extraction processes at Barnard Castle and Ulverston is maintained by staffs of chemists working on a continuous three-shift system. Many hundreds of samples of streptomycin are tested biologically, chemicaly and pharmacologically for potency and sterility, and when these analyses are complete the drug is ready for transfer in bulk to Greenford, where all filling and packing operations take place.

June 23, 1948, will go down in the company's records as an historical occasion, for it was on that day that the first vial of Glaxo streptomycin, to the order of the Ministry of Health, was filled and packed. Since then well over half a million vials of it have been dispatched from the Greenford laboratories.

Constructional work on the Glaxo £1 million streptomycin and penicillin plant at Ulverston began in January, 1947, and the first fermenter unit was inoculated on April 16, 1948, and the second followed it in the subsequent November. Modifications worked at on pilot plant scale at Barnard Castle have been incorporated in the production departments.

Besides the energetic efforts that have been going on at both plants to secure highest production levels of streptomycin, investigational research on dihydrostreptomycin has been proceeding smoothly.

Paint Group Segregates Interests

THE formation of four new companies is proposed by Lewis Berger & Sons, Ltd., two of which are to distinguish the United Kingdom and overseas interests of the parent body. The others are principally for home administrative purposes. The companies to be formed to separate the U.K. and overseas activities are Lewis Berger (U.K. Holdings), Ltd., and Lewis Berger (Overseas Holdings), Ltd. The directors have stated that if nationalisation of the paint industry appeared inevitable, they would consider convening a general meeting of stockholders of Lewis Berger & Sons for the purpose of putting that company into liquidation and authorising the distribution to the stockholders in specie of the shares in the three new subsidiaries.

Synthetic Drug Danger

Amidone, developed in Germany during the second World War as a substitute for morphine, is stated to be easily produced by " any trained chemist " at low cost and from readily available materials. It is reported by the North American Newspaper Alliance that the U.S. Treasury's Narcotics Division anticipates great difficulty in halting such drug traffic.

GERMANY'S CHEMICAL RECOVERY

Western Zone Production 90 per cent of 1936

by JAMES V. BRENNAN*

THE chemical industry of Western Germany has made considerable progress along the road to recovery. By October, 1949, production of chemicals in the area had reached 90 per cent of the 1936 level.

Economic union of the three western zones had been effected, and many materials and products were being freely exchanged within the integrated territory. Considering the many obstacles and adversities which have hampered the industrial rehabilitation of Germany, this is little short of remarkable.

It should be noted that statistics on postwar German production up to mid-1948 must be viewed with some reservation for a variety of reasons. Wartime disruption of the central government and apprehension over growing inflation, with a consequent resorting to black market and barter transactions, were the principal reasons why manufacturers reported only production sufficient for obtaining allocations of coal, power, and raw materials. They withheld certain unreported portions which were to be used as bartering exchange and to pay their workers.

The year 1936 has been selected as an approximately " normal " year, since war production had not yet begun to any great extent and the country had recovered by that time from the depression.

Chemical Substitutes

The primary concern of Germany's war planners had been for the development of chemical substitutes for critical industrial materials which might not be available in time of war. High on the list were textile fibres, rubber, petroleum, and fats. This led to research into and later development of substitutes for many essential commodities. Throughout World War II, the German chemical plant as a whole was being enlarged, and, despite the considerable damage suffered during the war, capacity was far greater in 1945 than it had been in 1939.

Current rate of production of most of the heavy chemicals in Bizonal Germany is in excess of that of 1936.

Production of fertilisers in the Bizone in 1936 and postwar is shown in the following table.

BIZONE PRODUCTION OF FERTILISERS
('000 Metric Tons)

Period	K_2O	N	P_2O_5
Year—1936	527.8	212.9	336.0
Monthly Average ...	44.0	17.7	28.0
Year—1946	283.9	106.5	81.1
Monthly Average ...	23.7	8.9	7.2
Year—1947	322.0	134.7	102.1
Monthly Average ...	26.8	11.2	8.5
Year—1948	509.7	201.0	200.7
Monthly Average ...	42.5	16.8	16.7
Jan.-June 1949 ...	328.0	139.5	150.5
Monthly Average ...	54.7	23.3	25.1

Source: Bipartite Commerce and Industry Group, Monthly Statistical Bulletin of the Central Commission for Germany (Br. Element), Vol. IV, No. 2, Feb. 1949, and June, 1949.

Dyestuffs

The once great dye industry felt the effects of the war-caused economic dislocation to a greater degree than did any other component of the German chemical industry. In 1936, production was in the neighbourhood of 37,000 tons; in 1947, when manufacture was resumed, output had decreased to around 4000 tons, or only 11 per cent of that in 1936. Considerable progress was made during 1948, however, and production for that year totalled 11,700 tons, or slightly more than 31 per cent of 1936. Further gains have been made during 1949, owing primarily to the availability of more nearly adequate coal supplies, so that during June of that year the production of 1400 tons was at the rate of 45 per cent of the 1936 monthly average.

Production of coal-tar chemicals other than dyes had risen to 75 per cent of the 1936 production by the end of 1948. Bizone output of coal-tar products ('000 metric tons) in 1936 (monthly average), with the monthly average of the January-June 1949 period shown in brackets, was: crude coal tar 90.1 (40.6); pitch 42.4 (44.9); oils 25.2 (24.8); phenol, cresols, xylenol 1.2 (0.7): crude benzol 25.0 (10.8); refined benzol 24.2 (20.0).

By far the largest single producer of chemicals in the French Zone of Germany is the I. G. Farbenindustrie (BASF) complex at Ludwigshafen-Oppau. Production in the Zone (except in the Saar Basin which, economically, is considered a part of France itself) increased 31 per cent in 1948 over 1947, and in the first half of 1949 approached the 1936 output. Present plans call for an increase by 1952 to 142.7 per cent of the 1936 level. The following table indicates the average monthly production in 1936 and postwar.

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* Mr. Brennan is a Foreign Service Officer detailed to the Chemical Branch, Department of Commerce, Washington, D.C. In preparing this report, which appears in the February 10 issue of *Chemical Industries*, from which this summary is taken, he had access to the latest Government information on German chemical production.

FRENCH ZONE PRODUCTION OF PRINCIPAL CHEMICALS
(Metric Tons)

Chemical	1936*	1947*	1948*	1949* (6 months)
Nitrogenous fertilisers (N)	9,180	3,613	4,009	5,688
Urea (N) ...	n.a.	595	998	263
Sulphuric acid (SO_3)	16,840	2,542	3,505	5,084
Sodium carbonate	2,884	1,943	3,205	4,627
Chlorine ...		1,896	1,360	2,389
Calcium carbide	6,600	4,872	6,739	6,259
Methanol	n.a.	1,655	1.996	1,777
Formaldehyde (30 per cent)	n.a.	1,980	2,573	2,836
Hydrochloric acid (100 per cent)** ...	n.a.	439	493	848 (March)

* Only monthly averages available.

** "French Mensuel," April, 1949.

Source: Report on the Economic Evolution of the French Zone of Germany, High Commissioner of the French Republic in Germany.

Note.—n.a. = not available. Ludwigshafen-Oppau produced some methanol before the war and it operated a pilot plant where urea was probably produced; however, no production figures are available.

The German chemical industry of to-day is more widely distributed than ever before. In the last phases of the war-preparation programme the chief concern was the placing of new factories at points where they could most readily utilise home resources if the normal sources of supply were to be cut off. Therefore, some of the plants whose capacity was designed to make Germany self-sufficient were placed in or near the forested regions of the south. As the war progressed and Germany became subjected to air attacks, there was a shifting of construction from areas where peacetime developments would normally have taken place.

I. G. Farben's Importance

In 1943, there were 4000-odd chemical plants in Greater Germany. The I. G. cartel owned directly, or participated in the ownership or operation of, about 380 plants. However, the importance of this firm to the chemical industry may be adjudged by the fact that it accounted for approximately 50 to 55 per cent of all chemicals and allied products in Germany.

Production of chemicals remains one of the important industries of Western Germany.

Although the three Western Zones are now a single economic entity, the lack of comparable statistics for the French Zone before mid-1949—particularly on foreign trade—has made it advisable to treat the Bizone and the French Zone separately for industrial purposes.

About 53 per cent of the chemical production of all Germany in 1936 came from the Bizone. The following table shows production of the principal industrial chemicals manufactured in the Bizone in 1936, and postwar.

BIZONE PRODUCTION OF PRINCIPAL INDUSTRIAL CHEMICALS
('000 Metric Tons)

Period	Sulphuric Acid	Caustic Soda	Chlorine	Soda Ash	Calcium Carbide
Year—1936 ...	821.0	94.8	61.2	375.0	477.6
Monthly Av.	68.4	7.9	5.1	31.2	39.8
Year—1946 ..	279.2	82.1	61.0	205.8	234.7
Monthly Av.	23.3	6.8	5.1	17.1	19.6
Year—1947	421.8	89.6	65.0	253.8	215.5
Monthly Av	35.2	7.5	5.4	21.1	18.0
Year—1948 .	620.5	155.4	100.5	377.2	333.6
Monthly Av.	51.7	12.9	8.4	31.4	27.8
Jan.-June 1949	435.3	110.6	68.3	261.7	212.3
Monthly Av.	72.5	18.4	11.4	43.6	35.4

Source: Bipartite Commerce and Industry Group, Monthly Statistical Bulletin of the Central Commission for Germany (Br. Element), Vol. IV, No. 2, Feb., 1949, and June, 1949.

Chemistry and Stone Building

THE part which chemistry can play to help revive one of the country's oldest and most treasured industries, building in stone, is deserving of greater recognition. High costs and the lack of scientific research for reducing them still retard the work of making construction in stone as common as it deserves to be.

These facts are revealed by W. J. Arkell, a geologist of international repute, in an article in *Endeavour* (9, No. 33, pp. 40-44). He claims that a most obvious and essential responsibility of science is to provide means of determining the durability of building stones, and he has acknowledged the good work already undertaken at Watford by the Building Research Station.

For Portland stone and some similar oolites the crystallisation test has been found most reliable. This requires specimens of standard size to be soaked in a 14 per cent solution of sodium sulphate and dried in an oven under strict control. The force of crystallisation disrupts the weaker stones but not the stronger. The Building Research Station has also found that stones of proved durability have the lowest microporosity, states the author. Vigorous research is clearly needed if costs of stone building are to be reduced. At some quarries compressed air has revolutionised quarry-dressing of the freestone; some mechanical means of rough-dressing the walling-stone might also be devised.

DECLINE IN OIL PRODUCTION

Survey of World Supplies in 1949

THE continuation of the decline in world crude oil production noted in the first half of last year (The Chemical Age, *61*, 455) has been indicated by the fact that total output in 1949 was about 468 million metric tons, which was three million tons (or nearly one per cent) less than the record attained in 1948.

A very important factor was the decline of the U.S.A.'s share in total production by nearly 24 million tons, in contrast with an increase of 18 million tons in the Middle East. There were comparatively few changes in the Latin America countries, but Canada and a number of countries in the Eastern Hemisphere produced more than in 1948.

Despite some considerable variations in individual countries total output in the second half of 1949 remained at almost the same level as in the first six months, according to the February issue of the *Petroleum Press Service*.

The rise in Canada's production from 1.691 million tons in 1948 to 2.930 million tons last year was largely due to extensive and promising oil discoveries in Alberta. It is expected that the Dominion's output, which was running at an annual rate of over three million tons in 1949, will be doubled during the current year.

In Venezuela, output of heavy crude was substantially cut in the early half of 1949 because of lower demand, but most of the ground was regained later in the year and, in December, output reached a new record of 1,489,000 barrels per day. Colombia's production had been particularly low in 1948 owing to prolonged labour disputes, but output was boosted last year by bringing into production two new small fields. In Trinidad, a slight increase was achieved in spite of difficult geological conditions.

Production in Mexico increased substantially towards the end of the year to keep pace with rising home demand and total output rose from 8.376 million in 1948 to 8.700 million tons last year.

Production in Kuweit showed the most striking increase in the Middle East area, with a rise of six million tons, nearly doubling the output in 1948.

Iraq suffered from the closure throughout the year of the pipe-line from Kirkuk to Haifa. The recent opening of a second pipe-line from Kirkuk to Tripoli (Lebanon) has, however, raised the effective transport capacity to the Mediterranean to about six million tons annually, without the Haifa outlet.

Egyptian production was also slightly greater and commercial production was begun on a small scale in Eastern Turkey, the first shipment being made on December 31 from the Sheikdom of Quatar.

In the Far East, failure of reconstruction efforts in Burma was offset by further progress in the restoration of output in Indonesia. In Netherlands New Guinea, which entered the list of oil producing countries at the end of 1948, production from the Klamono field has been estab-

Estimated World Production of Crude Oil

	1948	1949
	(000 metric tons)	
U.S.A....	277,190	253,200
Canada	1,691	2,930
Venezuela	70,116	68,381
Colombia	3,372	4,163
Trinidad	2,885	3,050
Mexico	8,376	8,700
Argentina	3,330	3,200
Peru	1,872	1,970
Ecuador	338	340
Others[1]	80	80
Persia	25,269	27,080
Saudi Arabia	19,260	23,471
Kuweit	6,400	12,371
Iraq	3,153	3,845
Egypt	1,914	2,220
Bahrein	1,500	1,600
Others[2]	—	50
Indonesia[3]	4,120	5,650
Brit. Borneo[4]	2,870	3,540
Netherl. New Guinea	—	250
India	249	250
Others[5]	300	350
Germany	635	842
Netherlands	496	620
Others[6]	120	130
U.S.S.R.	29,100	33,200
Rumania	4,500	4,200
Austria	910	900
Hungary	470	510
Albania	245	330
Others[7]	210	240
World Total	470,971	467,663

[1] Bolivia, Brazil, Cuba ; [2] Quatar and Turkey ; [3] Excluding Netherlands New Guinea ; [4] Sarawak and Bruenei ; [5] Japan, Pakistan, China and Burma ; [6] U.K., France and French North Africa, Italy ; [7] Poland, Yugoslavia, and Czechoslovakia.—Source : Petroleum Press Service, xvii, 2, 1950, 31-32.

lished at about 250,000 tons annually. British Borneo raised its output still further to over 3½ million tons a year.

Important discoveries, made last year in both Holland and Germany, have resulted in a substantial increase in output. Hopeful indications of oil resources have been discovered in Northern Italy, but in France and in French North Africa, where the most extensive search is being made, no positive results have as yet been obtained.

Because of the scarcity of information about the countries of Eastern Europe, crude oil production estimates invariably contain a large element of uncertainty. However, output in the Soviet Union is estimated to have increased last year by 14 per cent to 33.2 million tons.

Output in Rumania, which increased by 18 per cent in 1948, under last year's production programme, should have shown a further rise, but is estimated to have been below the 1948 total. Eastern Austria was last year the scene of at least one important discovery, but many of the older fields are reported to be showing signs of exhaustion. Some increase may have occurred in Hungary, but production remained far below the goal of the three-year plan. Reports from Albania record a substantial advance in yields, but production in the remaining People's Republics, in spite of some increase reported from Poland, is merely of local significance.

RUBBER IN 1949

Decline of the Synthetic Product

THE reduction by almost 20 per cent of the U.S. output of synthetic rubber was mainly responsible for the world's smaller total of 440,332 tons in 1949, compared with 582,186 tons produced in the previous year.

The world production of natural rubber in 1949 is estimated to have been 1,482,500 long tons, 37,500 tons less than the 1948 output. World consumption of the natural product increased slightly (by 7500 tons) to an estimated 1,427,500 tons.

The Rubber Study Group, releasing these figures, has prepared a survey of the world's rubber situation at the end of 1949, showing stocks held by the principal producer and consumer nations of both natural and synthetic rubber.

Although British and U.S. consumption of natural rubber dropped by about 5 per cent and 8 per cent respectively, consumption in Western Germany increased almost 50 per cent—from 52,500 to 75,000 tons, and that of other European countries, excluding the U.S.S.R., from 223,971 to 247,138 tons. Russian consumption is estimated to have risen by 5000 tons to 105,000 tons in 1949.

World stocks at the end of 1949, excluding Government stocks not available to industry, are calculated by the Rubber Study Group at 757,500 tons of natural rubber and 110,000 tons of synthetic.

Five-Fold Increase of Rubber Latex Industry

SOME of the means by which latex foam production has been expanded in less than a quarter of a century into an industry with an annual output of 40,000 tons, valued at £16 million, were demonstrated in London this week by an exhibition of the varied applications of Dunlopillo.

The original cake-mixing machine in which latex foam was first produced at Fort Dunlop was demonstrated by Mr. F. C. Jennings, who was introduced as one of the " back-room boys."

Some of the problems which had to be overcome were described by Mr. Jennings, who recalled that the original latex received from Malaya consisted of one-third rubber to two-thirds water, and also lacked uniformity. On the recommendation of the company's chemists, centrifuges were installed on the plantation, so that a more concentrated latex containing 60 per cent rubber was obtained.

Preservation of latex had presented another difficulty. The original liquid would last only about six months, but after treatment with ammonia it could be safely kept for at least five or six years.

Soap was essential to produce the foaming, and the mixture could be set in 15 minutes by the introduction of a gelling agent.

A series of photographs showed stages in the production of Dunlopillo from the tapping of the rubber trees in Malaya to the production of the finished article.

Mr. Leonard Harral, describing the wide varieties of uses of the porous sponge rubber, said that production was five times greater than before the war. By improved methods, using the same space as in 1948, output last year had been increased by 38.5 per cent.

The exhibition is at present open to the trade, but will be on view to the public from February 27 to March 3.

TRADE WITH SCANDINAVIA

I.C.I. Foresees Better Prospects

THE value of Norway, Sweden and Denmark, as markets for British chemical products is increasingly evident. With the freeing this year of some important materials from import duty, the Scandinavian countries are showing their need to obtain from Britain and the U.S.A. industrial goods which, before 1939, were imported from Germany.

Some indication of the importance of these countries to I.C.I., Ltd., is given in the current issue of *I.C.I. Magazine*, which states that the organisation is represented in Scandinavia by a large number of agents—about 15 in Denmark, 20 in Sweden and 12 in Norway—as well as by a liaison office in Gothenburg, Sweden.

The whole of Scandinavia shows an unmistakable desire for vigorous trade relations with this country, and its potential turnover with I.C.I. is large, states the company's European department. Unfortunately, numerous artificial barriers still result in a great discrepancy between what would be commercially possible and what is in fact possible in the present unnatural conditions of European trade.

The relaxation of trading restrictions, helped largely by the OEEC, is said to have greatly improved I.C.I.'s business, notably in exports of dyes to Sweden.

Practically all I.C.I. divisions do business with Scandinavia, and some is on a large scale; Metals Division, for instance, already has an annual turnover of more than £500,000. In the absence of restrictions, Dyestuffs Division alone would probably do business to the value of over £1 million; the turnover in heavy chemicals might well be about the same; and Nobel Division could conceivably exceed £200,000.

The devaluation of Scandinavian currencies in line with sterling has also improved trading prospects, but it is realised that the German share in the Scandinavian market is likely to increase.

Norway's Export Totals

Exports from Norway last year almost exactly corresponded with the budget estimate of £105 million. Chemical fertiliser exports rose by £2 million to £7 million; fats and cod liver oil increased from £15 to £18 million, but timber products (pulp, paper, etc.) declined from £31 to £29 million. Total imports for 1949 exceeded the budget estimate by £10 million.

PEST CONTROL PRODUCTS

Need For Simplified Names

THE great advance in the development of chemicals for pest control, particularly in the past ten years, has made it necessary that new compounds, as they made their appearance in the medical and other industrial fields, should be given names.

Chemical nomenclature has in many instances been too complicated for common use, and shortened forms and trade names have therefore been devised. As there may be several of these applied to one chemical compound, confusion has arisen in commercial descriptions of products and in the scientific literature.

This problem was discussed at the Commonwealth Entomological Conference in 1948 and a resolution was passed urging the appointment of a committee to agree common names for established compounds.

The Commonwealth Agriculture Bureaux accordingly referred the recommendation to the British Standards Institution, which has now appointed a technical committee "to prepare standards for the nomenclature of insecticidal and fungicidal chemicals and other pest control products." It is not intended that the simpler names should conflict with proprietary names; they should indicate to users the active ingredients of pest control products.

The committee has as its chairman Mr. H. J. Jones, A.R.I.C., and includes representatives of Commonwealth countries, Government departments, scientific societies and manufacturers' organisations.

It is stated to be working in the closest collaboration with the standards organisations in Commonwealth countries, and with the Inter-Departmental Committee on Pest Control in the U.S.A. Standards organisations in other countries have been informed of the committee's objects and it is hoped that it may eventually be possible to arrive at international agreement on nomenclature.

Scandinavian Exchanges

A protocol broadening the trade agreement between Norway and Sweden for the exchange of goods during 1950 will permit a considerable increase in the level of trade in chemicals, metals, etc. Norway will supply greater quantities of nitrate of lime and aluminium, sulphur, pyrites, ferro-alloys, zinc and timber. Sweden's exports will include special steels, more machinery, iron and zinc ores, chemical products, timber and chemical wood pulp.

REDUCED STOCKS OF NON-FERROUS METALS

Fluctuations in December

THE details of production, consumption and stocks in December, issued by the British Bureau of Non-Ferrous Metal Statistics, reveal substantial fluctuations compared with November (THE CHEMICAL AGE, *62*, 44) and with December 1948 (*60*, 258). Prominent among these is primary refined copper production of which in December, at 7932 tons, showed a drop of 1416 tons since November and was 2661 tons less than in December 1948 Consumption of primary refined copper in December (24,325 tons) represented a drop of 4334 tons from the November figure of 28,059 tons. The total consumption figure of this item in December 1948 was also larger (28,326 tons).

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS		
Govt. and consumers' ...	50,570	86,036
Imports	4,400	13.287
PRODUCTION:		
Primary		7,932
Secondary .	1.997*	6,219
CONSUMPTION:		
Primary .	8,001	24,325
Secondary	—	14,517
Exports	1,577†	10
CLOSING STOCKS:		
Govt. and consumers' ...	46,796	82,878

* Rough Copper.
† Rough Copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	22,814	long tons
Alloyed copper products	22,670	,, ,,
Copper sulphate	3,801	,, ,,

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	37,377	64,169
Imports	7,241	10,016
PRODUCTION:		
Virgin and remelted	—	6,709
CONSUMPTION:		
Virgin (incl. debased)	7,592	19,025
Remelted and scrap	—	6,712*
Exports and Re-export	—	3
CLOSING STOCKS:		
Govt. and consumers'	37,026	61,570

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons			
	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	53,001	2,149	—
Other stocks ...	53	—	—	—
IMPORTS	—	9,951	—	80
PRODUCTION	184	—	2,188	—
CONSUMPTION	157	14,003	1,813	10,921
Exports ...	—	13	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	48,875	2,524	—
Other stocks ...	80	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,469
IMPORTS	—
PRODUCTION	—
CONSUMPTION	1,606
EXPORTS AND RE-EXPORTS	582

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	306
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	265

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	32.05

N.-F. METAL RESEARCH

New Laboratories Opened

THE new laboratories of the British Non-Ferrous Metals Research Association in Euston Street, London, were opened this week by Sir Ben Lockspeiser, secretary of the DSIR.

The original laboratories were destroyed by bombing in 1940, and the new building provides research facilities for immediate needs, athough it is foreseen that increasing demands from industry may soon render them inadequate.

Research in the scientific background of the process used in the extraction and manufacture of non-ferrous metals and alloys, and their selection for particular uses, is the first concern of the association.

Corrosion resistance is one of the topics of principal importance from the user's point of view, while information is frequently sought on mechanical properties and development of special alloys.

Problems suitable for the facilities and staff of the association and of importance to the industries concerned are dealt with by a research board which is advised by four industrial scientists representing sections of the non-ferrous metals industries.

Aluminium and magnesium are represented by Dr. C. J. Smithells; copper and nickel by Dr. W. E. Alkins; lead and tin by Colonel Sir Paul Gueterbock; and zinc and galvanising by Mr. Stanley Robson.

Basic Chemicals in November and December

Improvement in Levels of Production and Stocks

THE record of production of some basic chemical materials and metals in November last was in some instances slightly lower than the previous month, but there was a general increase over the output for November, 1948. Consumption levels remained fairly steady, while stocks showed an improvement over the same period of last year. Noteworthy exceptions were industrial alcohol and ammonia, reserves of which were greatly reduced.

Estimated numbers of employed in the chemical and allied trades in November (in thousands) again showed a rise to a total of 445.4, an increase of 1.3 over the October total. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 256.1 (187.2 men, 68.9 women); paints and varnishes 38.8 (27.0 men, 11.8 women); oils, greases, glue, etc., 67.0 (53.3 men, 13.7 women); pharmaceutical, toilet preparations, etc., 84.0 (42.2 men, 41.8 women).

These figures and the table given below are abstracted from the *Monthly Digest of Statistics*, No. 49 (HMSO, 2s. 6d.).

		November, 1949 Thousand Tons			November, 1948 Thousand Tons	
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	151.2*	148.0	—	133.4*	131.0	—
Sulphur	—	27.9*	87.1*	—	24.4*	66.1*
Pyrites	—	20.4*	84.0*	—	20.6*	68.0*
Spent oxide	—	17.0*	179.3*	—	17.2*	169.2*
Molasses (cane and beet)	58.1	22.3†	260.7	48.9	24.0†	248.8
Industrial alcohol (mil. bulk gal.)	1.6	2.46	2.4	1.7	2.21	8.45
Ammonia	—	6.82*	4.8*	—	6.58*	6.29*
Superphosphate	19.3	17.2	—	17.6	16.5	—
Compound fertiliser	161.5	111.9	—	155.9	111.6	—
Liming materials	—	710.0	—	—	558.9	—
Nitrogen content of nitrogenous fertilisers	20.41	19.36	—	20.22	19.61	—
Phosphate rock	—	93.3	203.4	—	90.3	178.5
Virgin aluminium	2.33	14.6	—	2.46	16.4	—
Virgin copper	—	30.9	136.6	—	31.3	115.7
Virgin zinc	—	19.6	64.2	—	18.7	49.9
Refined lead	—	17.9	55.2	—	19.0	21.4
Tin	—	2.03	22.3	—	2.1	17.1
Zinc concentrates	—	13.4	77.0	—	12.0	24.0
Magnesium	0.52	0.41	—	0.45	0.53	—
Pig iron	186.0*	141.0	526.0*	176.0*‡	141.0	279.0*
Steel ingots and castings (including alloys)	291.0*	—	1,245.0	282.0*‡	—	1,002.0
Rubber: Reclaimed	0.51	0.59	2.33	0.47	0.49	4.15
Natural (including latex)	—	4.02‡^{c}	41.9	—	4.68‡^{c}	58.7
Synthetic	—	0.05	1.22	—	0.05	2.05

* December. † Distilling only. ‡ Average of five weeks. ^{c} October.

Belgian Chemical Industry

THE Belgian Minister of Economy has been studying the effects of Marshall Aid on the country's chemistry industry. He has estimated that if the aid continues until 1952, the number of persons employed in the industry will be about 32,000, against 33,000 at the end of 1947 and 29,000 at the end of 1948. Without Marshall Aid, the number is expected to remain constant at 29,000 until 1952, but is unlikely to vary greatly because the industry is already highly mechanised. Fluctuations are likely only in the production of nitrogen manures, caustic soda, calcium carbide, copper sulphate, sodium sulphate, artificial resins and aniline dyes.

China's Tung Oil Exports

CHINA'S probable production of tung oil in 1949-50 is estimated at 100,000 metric tons, a decline from the 115,000 tons produced in 1948-49, which was the highest quantity since pre-war years. The indicated exportable surplus is 65,000 to 70,000 tons which, together with the unmarketed portion of last season's output, could enable exports in 1949-50 to equal the peak shipments of 85,000 tons in 1947-48, if marketing conditions were normal. The tendency towards increasing exports to the U.S.S.R. may, it is thought, reduce supplies of tung oil to other markets. Normally, the U.S.A. is the principal market for Chinese tung oil, taking about 75 per cent of exports.

Chemical Processing of Wood Waste

Numerous Applications in Building Industry

THE utilisation of wood waste for making wallboard and other materials of moulded construction, although a very young science, has made sufficient practical progress to be of great interest to the building industry.

At a recent conference at Harvard University, in the U.S.A., of the Northeastern Wood Utilisation Council (New Haven, Conn.) the potential uses of wood waste were discussed and a wide variety of materials described. Some of the proceedings are reported in *Svensk Pappers Tidning* (53, 39-40), of which a summary is reproduced here.

Potential Increases

Mr. E. S. Sowinski, who reported on his field survey of New England for the council, said that ample supplies of wood waste were available from the wood-using industries, more than 350,000 tons a year. It was pointed out by Mr. J. A. Nicholson, however, that public acceptance in the U.S.A. of new products based on wood waste could be encouraged by the better education of home owners, builders and architects in the merits and the limitations of such products.

In Sweden, consumption of wood waste and other fibre composition boards was stated to be seven times that of the U.S.A.

The manufacture of resin bonded boards from wood waste was the subject of a paper by Dr. O. Wyss, Interwood, Ltd., of Zürich, Switzerland. He showed the relation of the properties of fibre boards to their densities.

Soft boards with densities about 0.3, and hardboard, with densities about 1.0, were well known, but boards half hard (densities 0.5-0.6) and three-quarters hard (densities 0.7-0.8) were becoming important in Europe because they resembled wood more closely in working properties. Such boards were made by wet processes using the Asplund defibrator or other disintegrating devices and were urea or phenolic resin.

The dry processing of sawdust into a hardboard without resins was described by Dr. D. F. Othmer, head of the department of chemical engineering at the Polytechnic Institute of Brooklyn. A few per cent of inexpensive, readily available chemicals were dry mixed with sawdust which was then hot pressed. The board was strong, had a low water absorption and showed only a few per cent of swelling. It could be laminated with metal foils or plastics in the manufacturing process, in which fire or pest resistance characteristics could also be incorporated. The chemicals used during moulding apparently reacted with the wood substances, but the exact chemical reaction had not been clearly established.

The Xilon process, a semi-chemical process of pulping wood and other fibre wastes, developed in Italy by Azienda Brevetti Industrial and now available in the United States, was described by Paulo Marpillero. A two per cent solution of sulphuric acid in open tanks is used. The acid hydrolyses the pentosans in the wood and the softened wood is then neutralised and defibred mechanically, without removing the lignin. Two plants have been in operation in Italy for more than five years and plans for a plant in Brazil and in other countries are being formulated.

An example of wood waste utilisation for moulded construction materials was demonstrated by Durisol, Inc., New York 17. Durisol consists of chemically treated wood shavings bonded with portland cement and moulded under pressure. The product was said to be fire-resistant and to have good heat and sound insulating properties.

Resin-Bonded Board

The use and effect of resins in wood waste boards was reviewed by Mr. W. T. Sears, of the Monsanto Chemical Company, and some features of equipment available for wallboard manufacture were described by Mr. H. D. Thweatt, of the Lake Erie Engineering Company, Buffalo, N.Y.

A paper by Mr. Gösta Genberg, of Svenska Cellulosa AB, dealt with wallboards made by that company and another, by Mr. W. J. Fishbein, of the British Artificial Resins Co., Ltd., gave details of a machine for the continuous manufacture of resin bonded wallboard.

The board products of the Wonderwood Corporation, Corona del Mar, California, were also manufactured by six European countries. In the process wood waste was bonded with resins at a low heat and pressure into panels which could then be faced with veneers or plastics. They were claimed to be resistant to water, fungus, dry rot, termites and fire.

The full text of all the papers submitted at the conference and a transcript of the discussion is published in the council's bulletin series, January 1950.

Drugs and Fine Chemicals in 1949—III

Striking Effects of Combined Injection Therapy

by G. COLEMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

THE exceptionally rapid action of desoxycorticosterone acetate and ascorbic acid has beeen well established, as for example by Lewin and Wassen's observations of the combined injection in rheumatoid arthritis subjects. (*Lancet*, Nov. 26, 1949, 993.)

They found that a combined injection of these drugs gave most marked relief from pain and restoration of free movement less than an hour after injection in some cases and the effects might last from 2 hours to 24 hours or more before they wore off. The injection of ascorbic acid (vitamin C) must follow the injection of desoxycorticosterone within two to five minutes to be certain of full effect.

Desoxycorticosterone was introduced into the 1948 edition of the British Pharmacopœia and is a 21-hydroxy derivative of progesterone. It was first isolated from the adrenal cortex in small amounts by Reichstein and other in 1938 (*Helv. Chim. Acta*, 1938, *21*, 1197). By contrast with cortisone, desoxycorticosterone seems to be concerned mainly with the metabolism of salt and the maintenance of the salt balance within the body's tissues. Cortisone, in common with other hormones of the adrenal cortex, with a ketone or hydroxy group at C-11, has only a slight effect on salt retention.

Ineffective Alone

Desoxycorticosterone and other steroids which resemble it in structure fall into the Groups 1 and 2 mentioned in an earlier article, and seem to have no effect on the course of rheumatoid arthritis. That property appears to be restricted to cortisone and the hormones in Group 3 which control carbohydrate metabolism. This effect of the combined administration of desoxycorticosterone and ascorbic acid is, therefore, a very surprising one.

The findings of Lewin and Wassen have been supported and confirmed by Fox and Douthwaite.

On the other hand, Kellegren (*Lancet*, Dec. 10, 1949, 1108), working at the Rheumatism Research Centre at the University of Manchester, has repeated the work of Lewin and Wassen, using a series of objective tests devised by him and his colleagues for measuring the potency of antirheumatic remedies. By these criteria they were unable to demonstrate any beneficial results from the combined therapy. They suggest that one reason for the conflicting reports may be confusion in the differential diagnosis of rheumatic fever and rheumatoid arthritis. Similarly, Hartfall and Harris (*Lancet*, Dec. 24, 1949, 1202) and Lloyd, Hart and Starer (*Lancet*, Dec. 24, 1949, 1204) report unfavourably on the treatment by combined injection.

Fox admits that the whole problem of rheumatic disease is complex and that the endocrine element—*i.e.*, the effects due to the interplay of hormones in glandular secretions—may be only one factor which, in rheumatoid arthritis is, however, undoubtedly a determining one.

Confirmatory Results

Vay and Loxton (*Lancet*, Dec. 17, 1949, 1134) also confirm the results of Lewin and Wassen, having treated 23 cases of polyarthritis, mostly of the rheumatoid arthritis types, with the combined injection therapy. Six of these cases showed dramatic improvement for several hours' duration; 15 showed a little very temporary improvement and two failed to respond.

This combined injection therapy will, undoubtedly, be exhaustively explored in coming months if only because—unlike cortisone and adrenocorticotropic hormone —desoxycorticosterone acetate is made readily accessible by synthesis and ascorbic acid is, of course, freely and cheaply available. Fox has estimated that the combined injection costs about 7s. 6d. per injection; whereas the cortisone or ACTH treatment is prohibitively costly.

Selye, of the University of Montreal, has studied over a period of years the participation of the adrenal cortex in the parthogenesis of arthritis and had concluded over five years ago that the adrenal cortex might play an important rôle in this connection (*J. Amer. Med. Ass.*, 1944, *124*, 201). At that time it had been observed that both lyophilised anterior pituitary gland and desoxycorticosterone actually produced arthritis in experimental animals, but not with that degree of regularity necessary for systematic investigation.

It is again worthy of note that in this

respect, that is in the stimulation of arthritis, desoxycorticosterone has an opposite effect to cortisone which makes the combined desoxycorticosterone/ascorbic acid therapy difficult of explanation.

Selye has now demonstrated that acute arthritis or periarthritis induced in experimental animals by the local injection of formaldehyde is aggravated by pretreatment of the animal with desoxycorticosterone or crude anterior pituitary preparations. But " formalin-arthritis " may be almost completely inhibited by pretreatment with either cortisone or adrenocorticotropic hormone. This indicates a possible antagonism between each of these pairs of substances.

Current Theory

Selye considers it " rather probable " that the inhibition of " formalin-arthritis " by ACTH, cortisone or " alarm reaction " may be due to the effect of a cortisone-like " glucocorticoid " (in contradistinction with "mineralocorticoids" which have an action on salt metabolism similar to that of desoxycorticosterone) on the directly injured tissues.

The mechanism of the response is unknown as yet; but it may involve the known antihyaluronidase effect of glucocorticoids or their known antihistaminic activity (" hyaluronidase " is the "spreading factor" which is able to modify the permeability of the tissues of the body). In this connection it has long been assumed that histamine-like compounds released from the tissues at the seat of an injury play a major rôle in the processes of inflammation. Selye suggests that it would be of great interest to examine the value of antihistaminics in some of the clinical conditions met with in rheumatism.

It has already been pointed out that one of the problems in synthesising cortisone is the introduction of oxygen at the C-11 position. The methods to achieve this have been comprehensively reviewed by Fieser and Fieser (" Natural Products Related to Phenanthrene," 3rd Edition, p. 452, *et. seq.;* Reinhold Publishing Co., N.Y., 1949).

Hechtor *et al.*, however, now describe a novel approach to this difficult synthetic problem using a biochemical technique (*J. Amer. Chem. Soc.*, 1949, *71*, 3261). 11-desoxycorticosterone was perfused through isolated adrenal glands and the perfusate was found to possess glycogenic activity which could not be explained except on the basis that the isolated adrenal gland had introduced an oxygen function at C-11.

This clue was followed and eventually corticosterone was isolated as the principal transformation product. 11-desoxycorticosterone - 21 - acetate also yielded corticosterone, the ester group being hydrolysed during the perfusion. The authors are extending these biochemical studies to a series of steroids and their results will be awaited with interest.

Koechlin *et al.* (*J. Amer. Chem. Soc.*, 1949, *71*, 3263) describe the synthesis of " Compound S "which is the 11-desoxy-analogue of Kendall's Compound E (Cortisone) from 11 : 20-diketo-steroids by the introduction of a 17 : α-hydroxy group into 3 : α-alkyloxy-17 : α-hydroxypregnan-20-one.

It will be seen that a great intensification of work in the field of the cortical steroids will develop in ensuing years. It is not beyond the bounds of reasonable probability that the use of cortisone in the temporary relief of the symptoms of rheumatoid arthritis may become a side-issue compared with the enormous new fields in chemistry, biochemistry and physiology which the discoveries of Kendall and Hench have laid open in such a fascinating way.

Use of Chemical Methods

In another field of steroid chemistry Watteville, Salinger and Borth (*Brit. Med. J.*, Aug. 13, 1949, 352) have stressed the increasing importance attached to the determination of the concentration of sex hormones in the body fluids as an aid in diagnosis. They point out that there are, in many cases, alternative chemical and biological methods of assay.

Chemical methods are cheaper and simpler to carry out; but in any chemical method which might be adopted it is necessary to establish that certain chemical structures with specific properties are really typical of a given hormone or of its metabolites, and that no other compound in the tissue extract shows these particular properties or reactions.

This is a very limiting consideration at present. For this reason, for example, gonadotropins, which are protein derivatives of unknown constitution, can only be assayed exclusively by the more costly and cumbersome biological methods. In the case of the naturally occurring œstrogens (œstradione, œstrone, and œstriol) colorimetric methods have been developed but they are insufficiently sensitive, except when the steroid is in high concentration in the body fluids, as in pregnancy.

A fluorimetric method has, however, been developed by Jailes (*Endocrinology*, 1947, *41*, 198; *J. Clin. Endocrinol*, 1948, *8*, 564), which has proved sufficiently satisfactory to have been used extensively in veterinary medicine.

It was made clear in an earlier article that the mechanism by which cortisone works in rheumatoid arthritis is, at present, unknown; but there are already indications that its action in rheumatoid arthritis may be a manifestation of a more general mechanism by which the body's reaction to an exciting agent may be modified; or, in other words, a mechanism by which hypersensitive reactions are "blocked."

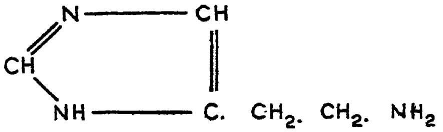
An important piece of evidence contributing to the support of such a hypothesis has been provided by Bordley *et al.* (*Bull. Johns Hopkins Hosp.*, 1949, *85*, 896; *Lancet*, Dec. 24, 1949, 1185) who appear to have obtained marked results in the treatment of allergic conditions, using the adrenocorticotropic hormone.

Continued Application

By such treatment dramatically rapid recovery has been obtained in such cases as exfoliative dermatitis due to iodine, penicillin sensitivity and chronic asthma. As in the treatment of rheumatoid arthritis with cortisone or ACTH, there was a tendency for relapse some time after completion of the course of treatment.

It would appear, that, for some time to come at least, the use of antihistaminic drugs in the treatment of various allergic diseases is not likely to be displaced. In fact the past year has shown some rapid advances in this field—mainly by way of fresh discoveries in their field of usefulness rather than any new developments in the chemistry of these drugs.

The mechanism of allergic reactions is far from being fully understood. It seems clear, even though it has not been proved, that the release of free histamine in affected tissues is to some degree responsible for the variety of allergic symptoms and the manifestation of anaphylactic shock. Histamine (4-β-iminazolylethylamine) is normally bound up in some complex in the tissues; it appears to be released in an uncombined form when damage is suffered by the tissue.



Histamine

Free histamine causes contraction of plain muscle and dilation of the capillary blood vessels with other consequences which lead to the various manifestations of allergy. Much thought has been given to the means by which histamine, thus released in a free form, might be rendered harmless to the tissues. One line of attack has been actually to inject hastamine in gradually increasing doses in an attempt to desensitise. This has not proved a very fruitful approach. Another line of approach has been to inject a soluble histamineazoprotein in the hope of creating, through an antibody promoting mechanism, a tolerance to histamine. *(To be continued)*

Fertiliser Experiments with Urea-Formaldehyde

A SOURCE of nitrogen for tobacco fertilisation is said to have been obtained by the development of a new urea-formaldehyde compound.

Mr. T. R. Swanback, an agricultural chemist of the Connecticut Agricultural Experiment Station, has been conducting experiments with the material, obtained from the U.S. Department of Agriculture, Beltsville, Md., for the past two years, states *The American Fertiliser* (*112*, No. 1, 18).

He has found that the urea-formaldehyde ("urea form") in combination with cottonseed meal results in 16 to 23 per cent increase in grading and yield over cottonseed meal alone. The combination material has an advantage over urea alone because its nitrifying action is slower. Urea releases too much ammonia too soon and this affects tobacco adversely, producing too much dark colour in the leaf. Urea-form, producing ammonia more slowly, is said not to have this effect. In comparison with cottonseed meal, four per cent less dark leaf colour was produced with the urea-form-cottonseed meal treatment.

Mr. Swanback found that the treatment giving best crop value (yield plus grading of tobacco) was a mixture of 25 per cent urea-form and 75 per cent cottonseed meal. Urea-form has so far been available for experimental purposes only, but it may be on the market in 1950 or 1951. It will sell at a lower price than nitrogen in cottonseed meal.

THE COMBINED MANUFACTURE OF CEMENT AND CHEMICAL PRODUCTS

Important Commercial Processes Involved

by H. LAFUMA*

THE principle of manufacturing simultaneously cement and chemical products required in large yields, such as alumina, phosporus or its derivatives, or metallurgical products, is already well established and its development has led to the inception of some important commercial processes.

Technical Difficulties

With the current stage of commercial development, these simultaneous processes are somewhat limited at present by certain technical difficulties. Some of these difficulties, however, may be evaded by modifying the processing, so as to have to deal with, at each stage of manufacture, not more than one commercial product. It is in this direction that the trend of present technical and commercial development is turning. Future development technique will establish a close liaison between cement manufacture and the large chemical manufacturing industries, a conception which appears to be approaching realisation in some quarters.

The French Service des Poudres organisation is studying at the moment the conversion of the Miramas factory, which has been using the I.G. Farben process for the production of cement and sulphuric acid, to make possible the manufacture of alumina and sulphuric acid, with the ultimate possibility of adding cement manufacture.

The Bayer Process

Several factories are projected elsewhere and in Rumania a factory in operation is working on the extraction of alumina from bauxites which are not of a suitable nature to be processed by the Bayer procedure.

Two factories were constructed during the war, one in Czechoslovakia and the other near Berlin; they produced alumina, using as raw material waste cinders from central power stations and also a super cement from the residual muds, by re-kilning.

By its large-scale employment of blast furnace slags, the cement industry shares a close bond with the metallurgical industries. The cement industry has, with certain isolated exceptions, remained independent of the chemical manufacturing industries.

In actual cement manufacture or utilisation, very little recourse is made to the incorporation and use of chemical products. The true liaison between the two industries consists in the inherent possibilities of being able to manufacture, in parallel, both cement and chemical products in demand in bulk quantities.

It was around 1890 that the American Kayser put forward suggestions for the manufacture of cement, using as the starting raw material residues from the manufacture of alumina (by processing of clay). This would appear to be the first commercial proposal to combine the two industries of cement and chemical manufacture.

Cement and Iron

Around 1910, F. Basset proposed obtaining simultaneously cement and sulphuric acid, by replacing the chalk used during the kilning of the cement with gypsum, the actual manufacturing process remaining an orthodox cement manufacturing technique. Some 20 years later he put forward the further proposal to manufacture simultaneously cement and pig iron, a technique which would integrate much more closely the cement and iron producing industries than the more simple utilisation of the waste blast furnace slags for cement manufacture.

Basset, in his proposal for sulphuric acid, demonstrated that decomposing calcium sulphate at a red heat with silica could not afford an economical solution to the manufacturing problem because of the high fuel consumption involved and the absence of any commercial value for the residual calcium silicate.

To overcome this, he proposed to mix the gypsum with clay, in proportions which would provide a product having the properties of Portland cement and which would make an important contribution to the economics of the manufacturing process. He proposed also to facilitate the reaction of the mixture, at a bright red heat, by an addition of finely powdered coal, which would serve to reduce a part of the sulphate.

The gypsum, clay and dried coal are

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* The full text of this article, of which this is a condensed form, was published in *Chimie et Industrie*, 62, No. 3.

ground to a fine powder, mixed and processed in a rotary kiln where calcination takes place; the carbon affects the reduction reaction. The sulphur dioxide that is given off is converted into sulphuric acid by the contact procedure and the lime combines with the clay, producing Portland cement.

Although quite simple in principle, the large-scale operation of this process gave rise to many technical difficulties and the commercial results obtained were insufficient in themselves to interest the French cement manufacturers before the 1914 war.

It was during this war that the systematic researches in this field of work were conducted in Germany by J. Mueller and finally the process was developed to the commercial stage. The first large-scale unit was started up at Leverkusen factory of the I.G. Farbenindustrie in 1916. The incentive then was the wartime lack of pyrites for the manufacture of sulphuric acid by the normal process. Subsequently the process was used in England, at Billingham, and in France at Miramas in 1939. The chief motive of most of this work, however, was to have available a process that would be capable of ensuring an adequate potential of sulphuric acid manufacture in national emergency. The fact that the process was then on a commercially economic basis made its adoption all the more desirable.

Complicated Plant

The technical difficulties associated with the process in relation to the manufacture of sulphuric acid arise because it is necessary to deal with very large volumes of gas poor in SO_2 content. At the Miramas factory this content averages 3.5 to 4 per cent of SO_2. A fairly complicated plant layout is required.

On the cement manufacturing side of the process small variations in the course or atmosphere of the calcining stage can leave unaltered calcium sulphate in the product or will transform this into sulphide, to the detriment of the quality of the clinker produced.

In each case, the clinker obtained will be deficient in available lime; and, although differing opinions have been advanced on this aspect, it is a fact that cement clinkers produced by this process are invariably employed commercially as mixtures with cement clinkers produced by traditional methods. This appears, however, to be a matter of prudence rather than necessity.

In the case of the production of fused cements—*ciment-fondu*—the technical difficulties that arise in this connection are less evident, because the influence of a slight variation in the quantity of the iron oxide that may pass into the clinker, presents less inconvenience.

Basset's original conception for linking iron and cement production was to fire in the rotary kiln an iron mineral, to which had been added the compounds necessary for the formation of a cement clinker. One object was to obtain a very pure iron, due to the purifying action of the very basic slag, the fusion of which would be rather pointless. During the course of the firing in a reducing medium, the fused metal exudes from the kiln mix, collects and is tapped off, while the slag, which is not fused, becomes a true cement clinker.

Regulation of Atmosphere

The manufacture of the iron was soon found not to be a practical proposition, but by adapting the process to produce a more fusible iron, the technique was finally developed to a satisfactory stage and a solution was found of difficulties, such as the attack on the refractories, the formation of bridging rings in the kiln and the problem of a suitable regulation of the atmosphere, which must be a reducing one.

The first factory to work this process was located at Moncada in Spain, and was followed shortly afterwards by the factory at Alhandra in Portugal. More recent and employing various improvements and modifications is the plant of the Smith concern in Denmark and the starting, comparatively recently, under the initiative of M. Caquot, of the new installation of the Biache-Saint-Vaast cement works, in collaboration with the Denain-Anzin group. From this it would appear that the liaison between cement and metallurgical industry has become fairly well established. These combined processes may now be broadly considered by classification according to the complexity of the processing.

Double Processing and End Products

The combined manufacture of cement and alumina covers several phases:

(1) The kilning of a silico-aluminous mineral mixture, with lime, so proportioned that as a final result, a mixture is obtained, which has the property of spontaneously breaking down in water and which consists of non-saturated calcium aluminates and of dicalcium silicate.

(2) Solubilisation of the calcium aluminates, in a very dilute solution of alkaline carbonate, without the silica entering into solution.

(3) Precipitation of the lime by sodium carbonate.

(4) Precipitation of the alumina by carbonic acid which regenerates the sodium carbonate.

(5) Correcting the composition of the residue and re-kilning to obtain cement.

The above process of Séailles, the main French protagonist of combined operations, has the considerable industrial advantage that the composition of the cement obtained can be regulated at will. It does, in fact, provide an extremely elegant solution of certain American conceptions regarding the formulation of special characteristic cements for specialised applications—such as the construction of barrages and the construction of works in saline waters.

To give flexibility to the manufacture of cement and sulphuric acid, using gypsum as the raw material, the process can be combined with the manufacture of alumina, as outlined in the Séailles process. Then, the first kilning is arranged to give a sufficient decomposition of the calcium sulphate.

It might be anticipated that the presence of the calcium sulphate would introduce untoward operating effects, either by the formation of ternary compositions, rendering the alumina insoluble, or because of the obstacles offered to the auto-pulverising effect, because of the presence of the residual calcium sulphate.

Actual working experience has shown that these misgivings are seldom justified in actual practice. The calcium sulphate does not enter into a ternary composition, and if the process is operated under suitable working conditions a self-disintegrating clinker is obtained quite readily, containing soluble aluminates. The clinker is washed to extract the alumina from it and the correctly proportioned residue is then kilned to produce Portland cement.

There is technically little doubt that in the same manner this technique could be adapted to yield cement, alumina and phosphorus or derivatives. The process, however, has not yet emerged from the laboratory stage, while the processes previously described have in various countries been operating on the industrial scale.

Triethyl Phosphate: Additive, Catalyst and Intermediate

From A SPECIAL CORRESPONDENT

THE growing use, particularly in the U.S.A., of triethyl phosphate $(C_2H_5)_3PO_4$—recognises the marked versatility and low toxicity of this water white, mobile liquid. It is playing a useful part in processes as diversified as the preparation of diolefins, the polymerisation of vegetable oils, textile dyeing and the synthesis of insecticides. In the last connection it serves as an intermediate in the synthesis of the new insecticide, tetraethyl pyrophosphate, now replacing nicotine for the treatment of crops. The two organic phosphorus compounds, hexaethyl tetraphosphate and tetraethyl pyrophosphate, both of them rated highly as insecticides, are really mixtures of ethyl phosphates, of which the tetraethyl pyrophosphate is the most important.

Triethyl phosphate is being employed as a catalyst in the dehydration of glycols and olefinic alcohols for the preparation of diolefins, such as butanediol, pentanediol and hexanediol. These diolefins are colourless, stable, hygroscopic liquids of low volatility which are of particular interest for moistening and softening tobacco, regenerated cellulose, gelatine, paper, etc.

The polymerisation of coumarone, styrene, cashew nut oil, tung oil, etc., for the production of resinous compounds of interest for coatings and specialised purposes is another of the directions in which triethyl phosphate has been valuable. Cashew nut resins have been used in the manufacture of insulation varnishes, cold setting compounds and cements, brake linings, industrial floorings and linings and in paper and cloth laminated materials.

A further successful application is as an additive to various lubrication oils for high pressure work. Lubricants containing triethyl phosphate are reputed to have comparatively flat viscosity temperature curves, low pour points and high flash points. The additive has only a very slight corrosive action on the common metals and the addition of 1 per cent of di-isobutyl ketone reduces this action appreciably.

In the textile industry triethyl phosphate is recommended as a dyeing assistant, the phosphate being miscible with water, ethyl alcohol, ethyl acetate, acetone, benzene, chloroform, xylene, isobutanol and castor oil. Its use as an ingredient of sizing formulations has been patented (U.S. Pat. 2,448,57 / Sept. 7, 1948).

Triethyl phosphate is miscible with a number of common solvents, including water, and is partially soluble in mineral oil, paraffin, petrol, ethyl ether and carbon disulphide. It is remarkably stable and is only 0.8 per cent hydrolised after 144 hours at 120° F.

THE ELEMENTS OF COOLING WATER CONTROL—II

Conveying Movement from the Thermostat

by LEO WALTER, A.M.I.Mech.E., etc.

THERE are three principal ways of conveying movement from a thermostat: (1) direct, with or without some arrangement of mechanical leverage to increase the movement; (2) by means of a self-contained relay, and (3) by means of a relay bringing into operation some outside source of additional power, which, as has been seen, can be electricity or compressed air or liquid under pressure.

The rod and tube (metallic expansion) type thermostat offers little movement but plenty of power. It is possible, therefore, to increase the movement by an arrangement of levers. Besides, however, the loss of power which must be sacrificed to increased movement, leverage can introduce errors due to slackness of pivots and joints.

Magnified Movement

If the movement of the thermostat is equivalent to only one thousandth of an inch for a 10°F. rise in temperature the effect would have to be multiplied 12½ times to give the full movement of a 0.5 in. valve subjected to a temperature rise of 100°F.

It is not practicable to use a rod and tube type thermostat in industrial process work for operating directly anything other than a very small valve or an electric switch, but it is, of course, quite suitable for direct control of valves on domestic gas cookers and water heaters, and is widely used for those purposes.

A regulator with a bi-metal strip or coil thermostat produces more movement and more sensitivity than with a rod and tube thermostat, but much less power. These bi-metal thermostats are used principally for operating electric contact switches. For all practical purposes, the only application in which there is direct valve control of the heating medium is the use of the coil type in some kinds of thermostatic mixing valves. With the thermocouple there is no movement, so there cannot be direct operation of a valve; relays are essential.

Relay Operated Regulators

Relay operated temperature controllers can, in a sense, be classed as "self-acting," inasmuch as they do not need any source of power which is not already being used on the job. The source of power is the pressure of the cooling medium. Fig. 5 shows how they operate. The space A is the air or liquid, the temperature of which is being controlled. B is the thermostat and C is a pilot valve. Any of the direct-acting devices we have described can be used as the pilot system.

The pilot-valve is in a by-pass D which is taken off the main supply line E. Thus the pilot valve is able to control (according to signals from its thermostat) the admission of pressure to the diaphragm of the main control valve F. From this valve there is also a constant leak through D1 back into the supply line.

If it is supposed that in A a cooling process is being carried out and the thermostat at this moment is calling for increased cooling effect. The pilot valve will be open and admitting pressure to the diaphragm of the main valve. So long as the opening through the pilot valve is greater than the leak through D1, pressure will be maintained on the diaphragm and the main valve will be held open.

As soon as the thermostat reacts to falling process temperature the pilot valve will close until its aperture is smaller than the leak through D1. Then the pressure will leak away from the diaphragm and the main valve will close, thus interrupting the flow of the cooling water. This is the on/off control action.

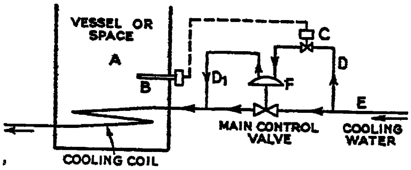

Fig. 5

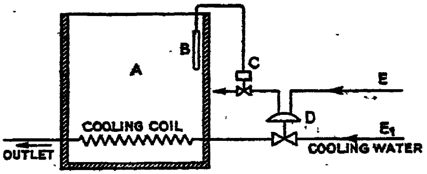

Fig. 6

The difference between these types and the last is that the relay mechanism brings into operation a separate source of power, such as air, water, electricity, or oil, to work the main valve, as shown in Fig. 6. A is the space being cooled: B the thermostat; C is the pilot valve. Through the small pipe E a supply of compressed air (or water) is connected to the diaphragm chamber of the main valve D.

From the diaphragm chamber there is also a leak through the pipe E1, but this time the leak is not constant. It is controlled by the pilot valve which, in turn, is operated by the thermostat. This time, when the thermostat is calling for increased cooling effect the pilot valve is closing the leak through E1, thus maintaining, through E, pressure on the diaphragm of the main valve and keeping the valve open. When the demand for cooling slackens, the reverse action takes place.

Action of Leak

Another modification is in connection with the leak. The compressed air, or whatever outside source of power is being used to operate the main valve, is controlled by the pilot valve, but there is also a branch to the thermostat. In this branch is a small hole which is covered and uncovered by the action of the thermostat.

When the hole is covered the full pressure of the compressed air is on the diaphragm. When the hole is uncovered there is a leak and consequent loss of pressure on the diaphragm of the main valve, which then shuts down on the heating medium. In power-operated temperate controllers, electricity is, of course, widely used as the source of power.

The thermostat itself operates electric contacts, which make and break the supply of current to the controlling device, which can be either an electro-magnetic (solenoid) valve or a motor-operated valve, or a motor starter for pump motors. In the solenoid valve, movement is obtained as a result of the electric current energising an electro-magnet which attracts an iron block on the end of the valve spindle, lifting the valve off its seat. When the current is broken by the action of the thermostat the magnet is de-energised and the valve drops back on its seat. (On/off method.)

In the motor-operated valve, the motor is usually a reversing one. The thermostat operates a two-way switch; in one position the motor drives the valve closed, and in the other it drives the valve open. In both cases, when the end of the stroke is reached an internal switch in the motor changes over in readiness for the circuit to be re-made by the action of the thermostat when the temperature changes. (Floating method of control.)

There is a liquid-filled type of cooling water regulator having a rigid stem, containing a liquid-filled flexible bellows, which expands or contracts longitudinally with change of temperature surrounding the thermostat bulb. An adjustable bypass is provided in American types to enable a minimum flow of cooling water to be set, as required. Sizes from 0.875 in. up to 1.5 in. diameter are being made.

The capacity of the control valve depends on the pressure difference across the valve. A three-way control valve, working on a similar principle, has its thermostat bulb connected by means of a flexible small-bore tubing to the valve closing element and control valve. The

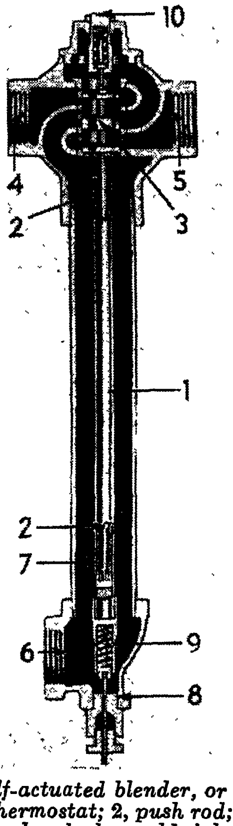

Fig. 7.—Self-actuated blender, or diversion valve: 1, Thermostat; 2, push rod; 3, piston valve; 4, valve body, cold inlet; 5, hot inlet; 6, outlet; 7, bellows tubing; 8, temperature setting; 9, relief spring; 10, cap.

valve then fulfils the function of a diversion valve, having one inlet on top, and two outlets. Used for Diesel engine cooling, one outlet leads to a cooler, the other to recirculation, during warming-up of the engine, when no cooling is required.

Fig. 7 shows a thermostatic three-way blender or diversion apparatus in sectional view. Used as mixer, 6 is the outlet, and 4 and 5 the respective inlets. Applied as diversion valve, 6 becomes the inlet and 4 and 5 the respective outlets. Movement of liquid-filled thermostat 1, located in the flow, is proportional to flow temperature, thus providing a gradual control movement of the piston valve 3. The application has already been explained.

There is a pneumatically operated mixing valve with diaphragm chamber, return spring and three-port valve. Control method applied is usually gradual (proportional), but pneumatic or hydraulic valves are sometimes used with a reset mechanism for heavy varying loads. (Reset method.)

Gradual Action

Among the gradual temperature regulators is a metal-expansion type of thermostat, acting by means of compressed air, or water under pressure, on a diaphragm control valve. The thermostat bulb is composed of an outer brass tube, which has an invar-rod fixed at its inner end. If the tube expands, due to increase of water temperature, the rod moves the flapper towards the air, or water, nozzle. Opening or closing of the nozzle aperture is performed in a gentle, gradual manner. If the nozzle mouth is small, back pressure and branch air-line pressure to the control valve will be built up gradually. This gradual change of output pressure from the control mechanism gently closes or opens the diaphragm valve by varying the pressure within the diaphragm chamber.

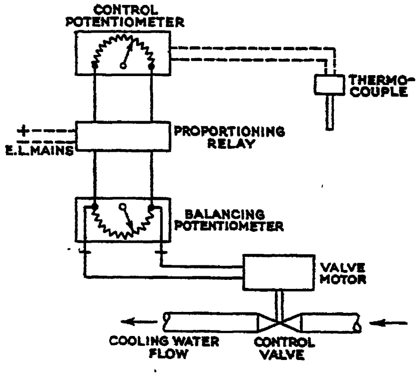

Fig. 8.

A hydraulic control sytem is used for very large valves. In this a mechanical impulse from a thermostat, pressure-stat or level-stat moves a small pilot valve in a relay mechanism, which in turn proportions hydraulic pressure above and below a piston in a power cylinder Basically, the floating method of control is performed with this simple layout, but any control method can be achieved by additional features.

Fig. 8 shows diagrammatically how the gradual method of control can be achieved electrically. An electrical impulse of varying intensity, for example, derived from varying cooling water temperature, moves an electrical resistance within the control instrument. A proportionally operating electric relay moves a balancing potentiometer, which in turn produces rotation of a motor fitted to the control valve. The whole electric system produces proportional control, and the control valve moves according to the amount of impulse received from an electric immersion thermostat or thermocouple.

(*To be continued*)

Flanged Steel Valves

ADVANTAGES of ensuring interchangeability between American and British equipment have led to the production of British Standard 1570 (flanged steel plug valves for the petroleum industry).

The standard, which is based on the American Petroleum Institute Standard 600B, contains full details of the design and manufacture of plug valves, and incorporates tables giving dimensional detail and pressure-temperature ratings for classes 150 to 2500.

Details of the materials used are provided in appendices and drawings show typical plug valves as well as end flange facings, as required by the various classes of valves.

Speed Recording

Two types of instrument for universal speed measurements—the transmitter and the indicator or grapher—are described in the latest catalogue (485/5001) of Everett, Edgecumbe & Co., Ltd. An advantage of these speed meters is that they can be easily installed and may be placed at any reasonable distance from the actual machine, the speed of which is being measured.

Portugal's Chemical Industry

Sulphuric Acid and Fertiliser Developments

CHEMICAL sections were well represented at the Lisbon Industrial Fair in November last and a serious attempt was made to convince buyers that in many branches of the chemical industry it was possible to procure from home production all their requirements, both in regard to quantity and quality. Whether that stage has yet been reached is open to doubt, but the participation at the fair of a large number of firms of relatively recent origin showed the trend of events.

Substantial Advance

Since the war, the Portuguese chemical industry has made substantial advance in at least two directions. Sulphuric acid production rose from 119,700 tons in 1938 to 203,826 tons in 1948. There are large reserves of pyrites in Portugal and the yield was 556,000 tons in 1948.

The other notable development, based on increased supplies of sulphuric acid, was that of superphosphate manufacture. The pre-war output of about 158,000 tons has now been nearly doubled, providing 302,845 tons in 1948. Imports of superphosphate have nearly been eliminated.

The Government has given effective encouragement to the production of nitrogenous fertilisers, with possibly more tangible results than have yet been produced by the similar policy in Spain. The development of cheap water-power has been vigorously carried on, and some 1500 million escudos have been spent on hydro-electric schemes.

Nitrogen Plants

The expenditure on nitrogen plants, planned up to 1952, is about 500 million escudos. Among the principal establishments is the Sociedade de Amoniaco Portuguesa, at Estarrejo in North Portugal, with a capacity of 50,000 tons ammonium sulphate a year, which started production in 1949. In 1950 it is intended to begin the manufacture of ammonium nitrate. Two other nitrogen firms are: Compania Uniaco Fabril in Central Portugal, and the Soc. Portuguesa de Azote in the south is awaiting completion of the hydro-electric works.

Large quantities of nitrogenous fertiliser have still to be imported. In 1947 these were valued at 88 million escudos, and included ammonium sulphate at 48 million escudos, with sodium nitrate (presumably from Chile) 33 million escudos. A factory for production of calcium nitrate and calcium carbide is being erected in Carnas de Senhorim by the Cia. Portuguesa de Fornos Electricos. Other projects by different firms include plant for calcium carbonate, sodium sulphide, caustic soda, zinc chloride, the higher alcohols, and insecticides.

It is hoped also to establish an important pharmaceutical industry and dispense with imports. There already exist some 85 small and medium-sized firms, and in two years, from 1946 to 1948, these have increased the value of their production from 160 to 208 million escudos. An earnest appeal for protective measures against foreign competition has been made to the Government in order that this industry may be more securely established.

Pharmaceuticals

Nothing is said, however, in this report (*Chimie et Industrie*, November 1949, 210) about the ambitious plans discussed a year or two ago for collaboration with Spain in developing all branches of the pharmaceutical industries. These included a thorough survey of the medicinal plant resources in both countries, the issue of a Pharmaceutical Codex —Hispano-Portuguesa—the training of pharmacists, and much else, which were to form the subject of a joint conference when these and other resolutions had been agreed.

The paint and varnish manufacturers are asking for increased tariff protection. Among new enterprises in this section is a modern factory owned by Fabrica de Tintas de Sacavem, that will specialise in rust-proof paints, heat-resistant aluminium paints, and varnishes. The plastics industry in Portugal is still in its infancy. A factory for the manufacture of phenol-formaldehyde resins and products started operation in August last year in Venda Nova, not far from Lisbon.

Production of insecticides and related materials is mainly limited at present to copper sulphate, output of which rose from 8000 tons in 1938 to 15,400 tons in 1948. An appreciable amount of arsenicals is also made, production reaching 1560 tons in 1948. Most of this was exported to Germany, Belgium, and England.

The Chemist's Bookshelf

MANUAL OF SPECTROSCOPY. Theodore A. Cutting. Chemical Publishing Co., Inc., New York. Pp. vi + 220, Figs. 28. $6.50.

This is a strange book. If sub-titles were still the fashion, it might almost have added to it the caption " *or* Spectroscopy (and many other curious aspects of Chemistry) in the home." Had it been radically pruned of its digressions, and published 15, or even 10 years ago, it would undoubtedly have been enthusiastically welcomed. There is about it, however, in these days of laboratories with elaborate departments devoted to quantitative spectrographic analysis, a flavour of irrelevant curiosity which is not without nostalgic appeal. Often useful tips in general chemistry are picked up from very old textbooks, and it is as least as likely that many will find valuable information in this book. There is a lot of truth in the author's contention that " spectroscopic equipment should be in every school and laboratory," even though his claim that present-day instruments are low in cost cannot be accepted so readily.

After a brief historical and theoretical review (of about intermediate standard), light sources are dealt with in the second chapter and spectroscopes in the third. These two chapters will be of interest to every small laboratory which has not got adequate simple equipment, since it describes the complete construction of everything that is essential, starting with a prism and a few lenses or a grating replica, together with (almost) the proverbial string and sealing wax. The author claims, for example, that the total cost for a concave replica spectrometer, giving a 10 or 12-in. spectrum, need not exceed $15 or $20. Chapter IV deals in an elementary fashion with the practice of spectroscopic analysis and will enable the amateur who remembers that it is the first, and not the last, word on the subject, to come to grips with the technique. Chapter V deals with what is clearly the author's hobby-horse, the spectroscope in mineralogy, and contains much extraneous information, such as a table of crystal forms and a scale of hardness.

It is in Chapter VI, which is entitled " Characteristic Lines of the Elements," that we are most aware that we are getting the catch from a very widely cast net. The characteristic lines are given, element by element, in alphabetical order. But in addition, we have an embarrassing wealth of " additional information." The section on Iodine is typical of the whole chapter, giving historical notes, a selection of physical and chemical properties which have no apparent connection with spectroscopy, and the price of crude iodine at that time ($1.92 per lb.).

A useful set of outstanding arc lines, arranged element by element and supplementing the lines listed in the detailed part, is followed by an unusual wave-length table-chart, which attempts to give a metrical guide to the lines, *seriatim*, from 6900 to 3900 Å. The precise advantages of the form chosen over a straight record are not clear, but the list is a valuable one, and it is only to be regretted that the table ignores the very important ultra-violet region. This region, fortunately, is not neglected in the lists arranged by elements. A few unimportant textual mistakes were noted and the caption to Fig. 28 certainly does not describe what is shown. Illinium and masurium are included as such in the detailed section on the elements.

The book can be recommended, with these reservations, as a useful and sometimes exhilarating introduction to the technique of spectroscopy. It is possible that the reviewer may one day be able to determine the reason for the inclusion in the bibliography of " Manual of Clinical Therapeutics," by W. C. Cutting, M.D.—C.W.L.

Radioactive Hazards

PROBLEMS concerning the protection of personnel, design of laboratory and equipment, etc., are discussed in a handbook " Safe Handling of Radioactive Isotopes " recently issued by the U.S. National Bureau of Standards. The main objectives are stated to be to prevent ingestion, inhalation, interstitial or other modes of entry into the body, and to reduce the amounts of external irradiation.

◆ HOME ◆

Opportunity for New Products

A new feature of the Engineering Centre, Ltd., Glasgow, is the introduction of a "latest products" section, which enables firms to display their most recent developments for one month, free of charge.

Coal Production

Britain's total coal output during the week ended February 11 was 4,342,300 tons, compared with 4,288,600 tons in the previous week and 4,311,100 tons in the week ended February 12 last year.

Freer Trade with Sweden

Chemicals and metals of a wide variety form the largest section of goods for which Sweden has announced that licences will be granted automatically from the United Kingdom, as well as from most other member countries of the OEEC.

Steel Output in January

Steel production in January was at an annual rate of 15,783,000 tons, compared with 15,002,000 tons a year ago. This, claims the British Iron and Steel Federation, is the highest production rate ever achieved in January.

Water Survey Resumed

The Government has decided to resume the work of the Inland Water Survey which was interrupted during the war. Mr. N. J. Pugh, vice-president of the Institution of Water Engineers, is a member of the re-constituted committee.

Future of Cement Industry

A letter to all Parliamentary candidates has been sent by the Associated Portland Cement Manufacturers, Ltd., stating six reasons why the cement industry should not be nationalised. Points made in the letter are cheapness of cement in Britain, higher productivity per worker than in U.S.A., lack of strikes, and schemes for profit-sharing.

N.T.P. Interest in Australia

National Titanium Pigments, Ltd., is acquiring a small interest in Zircon Rutile, Ltd., Melbourne, Victoria. At the last annual meeting of the Australian company it was stated that the directors had been negotiating with the British company to explore the possibility of manufacturing certain chemical products in Australia. Research on titanium oxide pigment had been carried out, and progress had been made by the Australian company in investigating the prospect of producing zirconium sulphate and neon powders.

Fire Closes Glass Works

As a result of fire early on February 12 at Bateson Bros., glass bottle manufacturing plant, Spekeland Road, Edge Hill, Liverpool, some 50 people will be temporarily out of work. A furnace burst and molten glass overflowed into a basement. The damage will entail a complete shutdown until repairs have been carried out.

U.K. Exports in January

United Kingdom exports in January are provisionally estimated to have reached the record of £175.8 million. This is £15.5 million higher than the previous record in November and £27.1 million above the monthly average for 1949. Imports in January were also higher, and the provisional figure of £201.2 million was only £0.5 million below the record figure of last June. Re-exports in January amounted approximately to £5.8 million, thus the excess of imports (valued cif) over total exports (valued fob) was £19.6 million. This was £16.2 million (45 per cent) below the monthly average for 1949.

A Modern Road System

A complete modern road system for Britain is a matter of concern to everyone, whether industrialist or private individual. "Roads—The New Way," a 55-page book, the latest publication of the British Road Federation, contains a pictorial survey of road-building activities, in town and country, in many parts of the world.

Carbon Black Finance

ONE of the impediments to the full development of the carbon black industry in the United Kingdom has been relieved by the decision, which the ECA has announced, to increase from $850,000 to $2,025,000 the amount of currency for which convertibility will be guaranteed in respect of the undertaking by Godfrey L. Cabot, Inc., to establish an undertaking at Ellesmere Port, Cheshire.

The parent company, in Boston, Mass., will subscribe part of a larger investment in capital stock, and for the rest will guarantee local bank borrowings. Construction of the plant, which is planned to produce 100,000 tons of carbon black a year (THE CHEMICAL AGE 60, 302), was begun last June and is expected to be finished and in operation by June this year.

Technical Publications

TANTALUM'S special interest to chemical engineers is derived almost entirely from its resistance to chemical attack. The properties, production and applications of this metal are described by G. L. Miller in the current issue of "Murex Review," published by Murex, Ltd., Rainham, Essex. The other main feature is an article by F. W. Salt on the electrodeposition of tungsten.

* * *

PROCEEDINGS of the Chemical Engineering Group of the Society of Chemical Industry for 1947 (Vol. 29) are now available. Papers include: "Aeronautics and the Chemical Engineer," by Sir Ben Lockspeiser; "Manufacture of Contact Sulphuric Acid from Arsenical Pyrites," by H. C. Millett; and "A New Process for the Recovery of Ethylene from Coke Oven Gas."

* * *

DEPOSIT-welded tools can now be added to solid cutting and electrically butt-welded high speed steel tools. Welding technology has been carried a stage further by the development of the Athyweld process by which it is claimed that a greater cutting efficiency can now be obtained from the deposit than from the original parent metal. The process and its applications are described in the current issue of "Edgar Allen News," published by Edgar Allen & Co., Ltd., Sheffield.

* * *

SIMULTANEOUS determination of refractive index and melting point has been suggested as a rapid and convenient method for the identification of substances with melting points below 200° F. Three American doctors have collaborated in the determination of the melting points and refractive indices at the melting point for many of the gums, waxes and resins normally encountered in a pharmaceutical laboratory. These constants appear in a report published in the Journal of the American Pharmaceutical Association, Scientific Edition (*38*: 495, 1949). The report includes also a description of the instrument used for the determinations, a refractometer supplied with a heating head, and the technique involved.

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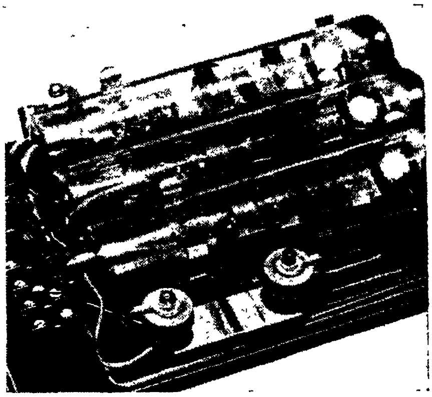


The new Sunvic multiple assembly for relay services

VACUUM switch tubes for relay links have formerly been supplied either loose or mounted with accessory equipment in Bakelite boxes. Sunvic Controls, Ltd., has now designed complete panel units of from one to three standard Sunvic Hot-wire tubes mounted on an insulated base plate. This arrangement, type PN relay, is described in the company's latest literature.

* * *

CHEMICAL structure and properties of the principal groups of plastic materials employed in the electrotechnical industry are described by J. C. Derksen and M. Stel in the main article of "Philips Technical Review" (Vol. 11, No. 2), and there is an investigation into the problems of lighting a dark room for developing photographic negatives.

* * *

CONFIRMATION of the value of the Training Within Industry scheme, sponsored by the Ministry of Labour and National Service, is contained in "Follow-Up," a booklet now issued by the TWI Association, North-West Region. The Heavy Engineering and Chemicals and Oils and Fats sub-committees formed in 1948 submitted some additional recommendations and appendix material and reveal, on the whole, a high degree of acceptance of the TWI principle.

* * *

NEW developments in protective clothing including PVC gloves for women workers and a fashioned mitt formed to provide a natural position for the finger tips are announced by James North & Sons, Ltd., Hyde, Cheshire.

PERSONAL

Trade and University Appointments

NEW officers of the British Non-Ferrous Metals Research Association have been elected as follows: the Hon. R. M. Preston, chairman of council, in succession to Sir John Greenly; Mr. F. C. Braby, vice-chairman and honorary treasurer; and Dr. Maurice Cook, chairman of the research board.

Shell Chemicals, Ltd., announces that Mr. S. W. Farrington will be taking over its Scottish division, the office of which is at 28 St. Enoch Square, Glasgow, in succession to Mr. C. Duckworth, who becomes manager of its midland division, at King Edward House, New Street, Birmingham. Mr. Duckworth succeeds Mr. J. A. Porter, who is taking up a post at the head office of Shell Chemicals, Ltd., in London.

A Chair of Brewing and Industrial Fermentation is to be established at the Heriot-Watt College, Edinburgh. Dr. I. A. Preece has been appointed the first professor. The doctor, who is 42, is editor of the *Journal of the Institute of Brewing*, and has carried out researches into problems connected with fermentation and brewing.

Mr. Norman Bournes, assistant works manager at Dunlop's Cambridge Street works, Manchester, has been appointed works manager there in succession to Mr. George Livings, who has retired after 53 years' service.

Among the appointments in the University of Manchester recently announced are: reader in pharmaceutical chemistry, Dr. K. Bullock; lecturers in physics, J. A. Newth; lecturer in chemistry, M. C. Whiting.

Miss Margaret Roberts, aged 24, food research chemist, a Conservative and one of the youngest election candidates, handed in her nomination papers at Dartford last week.

Mr. Izak Levie (commonly known as Jacques Polak) advisory director of Lever Bros. & Unilever, Ltd., domiciled in Holland, left estate in England valued at £45,553 gross, net personalty £44,644.

Dr. Juan Bautista de Nardo, professor of metallurgy in the University of La Plata, Buenos Ayres is on a visit to Britain.

THE TECHNICAL PRESS

A Widening Service to Industries

AUTHORITATIVE recognition was paid in London last week to the useful service rendered by the trade and technical journals of Benn Brothers, Ltd. (proprietors of The Chemical Age). The occasion was the annual dinner for directors and staffs at Grosvenor House, which more than 400 attended.

The courage with which the founders of the group, and notably Sir Ernest Benn, had met and overcome early difficulties was recalled by a leader in the field of technical and other publications, Lord Camrose, who proposed the toast of the firm.

In a reference to the wide range of the Benn publications, Lord Camrose said trade journals played a big part in the life of the nation. The British people depended on commerce more than most other nations, and he was certain the merchant and the trader needed the advice and help provided through the media of trade and technical journals. "You are now in a very prosperous and happy condition," he concluded. "I believe you are entitled to have very great confidence in the future of your firm."

Mr. Glanvill Benn, chairman of Benn Brothers, Ltd., who presided, acknowledged that his father, Sir Ernest Benn, had succeeded in creating an ever-widening circle of trade and technical publications which were doing great public service. The chairman conveyed a message of good wishes and encouragement from Sir Ernest Benn and Lady Benn gave an assurance of his progressive recovery from the illness which had enforced his absence.

Mr. Norman French proposed the toast of the guests and Lord Stansgate replied.

Obituary

THE death has occurred of Dr. George S. Cruikshanks, 72, a lecturer in technical chemistry at the Royal Technical College, Glasgow, between 1907 and 1946, who had published a number of papers on fuel technology. He was professor of chemistry at the Anderson College of Medicine, Glasgow, 1919-1947.

The death has occurred of Mr. James Laing, a former chairman of the I.C.I. explosives division at Stevenston, Ayrshire (now the Nobel division, with head office in Glasgow and main factory at Ardeer). Mr. Laing, who was 71, retired eight years ago.

Dr. Jaroslav Kulhanek (*see page* 250)

◆ OVERSEAS ◆

£1 Million Oil Project Ended

Drilling at an oil well at Lakhra, in the province of Sind, which has cost about £1 million, has been abandoned as uneconomic by the Burmah Oil Co. (Pakistan Concessions), Ltd. It is reported that large volumes of water were encountered at a depth of 12,660 ft. It is uncertain whether further drilling will be started in the Sind, or whether investigation here should be abandoned.

New German Anti-Corrosive

The Sinoxal GmbH, Geesthacht an der Elbe, is reported to have taken out patents for a new anti-corrosive, Sinoxal 5010, which is claimed to resist alkalis and weakly oxidising acids. On iron, it is stated to form a completely fast-holding, elastic and fire-proof layer, and described as being similar to enamel. Capacity of the works, using domestic raw materials only, is to be 10 tons per day.

Aid for Swedish Zinc Mining

A loan not to exceed $350,000 has been approved by the ECA to assist the AB Zincgruvor Co., of Sweden, to purchase special mining equipment in the U.S.A. for the zinc-lead-copper mines near Falun. The Swedish company, owned by Skandinaviska Banken, will raise about $2 million to complete the expansion programme. The U.S.A. will be paid in the form of zinc and lead metals.

Alsace Potassium Mining

Output of crude potassium from mines in Alsace amounted last year to 5.28 million tons, as compared with 4.46 million tons in 1948, 4.17 million tons in 1947, and an average of about 3.25 million tons in the immediate pre-war years. The K_2O-content rose to 896,000 tons, against 768,000 tons last year, and 716,000 tons in 1947. The current expansion programme seeks to increase output by 1957 to 1.2 million tons, in terms of K_2O.

New German Wood Preservative

A new product, which is claimed to render wood proof against fire, rotting and insect destruction, has recently been perfected by the Chemische Werke Albert, at Wiesbaden-Biebrich, Germany. It consists of a special salt with a basis of ammonium fluoride, and is said to have extremely good diffusion power and not to interfere with the natural respiration of wood. One kg. is stated to be sufficient for the triple protection of about 7 sq. m. of wood.

Austrian Graphite Production

Output of raw graphite in Austria amounted last year to 14,054 metric tons, compared with 10,718 tons in 1948. Refined graphite production rose from 9640 to 13,026 tons.

German Steel Industry

Considerable progress has been made in the work of reorganising the German steel industry and all the shares of the 25 new holding companies have now been allocated to the German Steel Trustee Association, states the Allied Combined Steel Group.

Cyanite Deposits in Austria

A cyanite deposit which has been discovered in the Austrian Tyrol is reported to be the only known occurrence in Europe justifying exploitation on a commercial scale. Its extent is believed to make possible an output which would not only cover Austria's estimated requirements of about 2000 metric tons per annum but would leave a substantial exportable surplus.

ECA Assistance for French Chemical Plant

The ECA has approved a recovery project for construction of a chemical plant at L'Etang de Berre, France, for La Sociétè Naphtachimie, to produce a number of organic chemicals, some constituting raw materials for plastics, synthetic fabrics, varnishes, lacquers, photographic supplies and similar products. The project will cost $13,853,000, of which ECA will provide $853,000.

Swiss Nylon

A Swiss firm, Holzverzuckerungs AG, Ems, is reported to have decided to manufacture nylon, following research work carried out since shortly after the war ended. Plant for the production of the basic chemical and textile materials is under construction and the new product—Grilon—is expected to be able to compete in the world market. Production should start early in 1951.

Israel Plans 60,000-ton Rolling Mill

Plans are being developed by Solel Boneh, Ltd., a diversified industrial manufacturing organisation in Israel, to construct near Haifa the first steel rolling mill with an annual capacity of 60,000 tons. H. A. Brassert & Company, New York, consulting engineers, are collaborating. Solel Boneh already operates a cement plant, glass works, brick works, foundry and fabricating shop.

Next Week's Events

MONDAY, FEBRUARY 20

Electrodepositors' Technical Society

London: Kingsway Hall, W.C.2, 5.30 p.m. R. Wall: "Bright Nickel and Chromium Plating—Batch Production."

TUESDAY, FEBRUARY 21

The Chemical Society

Leeds: University, 5 p.m. Scientific films. 6.30 p.m. (with Leeds University Chemical Society). Dr. H. D. Springall: "Some Recent Applications of Dipole-moment Measurements to Molecular Structure."

Institute of Petroleum

Manchester: Engineers' Club, 6.30 p.m. Symposium: "The Petroleum Industry as a Career."

WEDNESDAY, FEBRUARY 22

Society of Chemical Industry

London: Royal Institution, Albemarle Street, W.1, 6.30 p.m. Dr. H. Baines: "Photography in the Service of the Scientist."

Manchester Literary and Philosophical Society

Manchester: Portico Library, Mosley Street, 5.45 p.m. Dr. E. G. Edwards: "Some Aspects of Freedom for Science."

The Plastics Institute

London: Waldorf Hotel, Aldwych, W.C.2, 6.30 p.m. A. A. Tomkins: "Advances in Moulding Technique."

The Society of Visiting Scientists

London: 50 Old Burlington Street, W.1. 7.30 p.m. Discussion: "The Planning of Agricultural Research in Great Britain."

THURSDAY, FEBRUARY 23

The Chemical Society

Manchester: Engineers' Club, Albert Square. 6.30 p.m. (with RIC and SCI). Prof. E. R. H. Jones: "Research in Progress in the Organic Chemistry Department of Manchester University."

Nottingham: Lecture Theatre, Department of Chemistry, University, 6.30 p.m. Prof. A. R. Todd: "Synthesis in the Nucleotide Field."

Incorporated Plant Engineers

Sheffield: Grand Hotel, 7.30 p.m. A. V. Shaw: "Non-Ferrous Metals."

The Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. C. E. Ransley: "Gases in Metals."

FRIDAY, FEBRUARY 24

The Chemical Society

Glasgow: Royal Technical College, 7 p.m. Local annual general meeting and reading of original papers.

Oil and Colour Chemists' Association

Manchester: Chemistry Lecture Theatre, The University, 6.30 p.m. Prof. M. G. Evans: "The Design of Experiment."

ASLIB (Northern Branch)

Huddersfield: Technical College, Queen Street South, 2.30 p.m. Mrs. M. Dean: "The Organisation of a Small Industrial Library."

Lecture Postponed

The Royal Institute of Chemistry announces that the meeting arranged for Wednesday, February 22, at Reading University has been postponed until Wednesday, March 8, when Dr. G. W. Scott Blair will speak on "Recent Advances in Rheology."

Royal Society Lectures

THE following lectures for 1950 have been announced by the Royal Society.

The Bakerian Lecture will be delivered on Thursday, May 4, by Prof. P. W. Bridgman, Lyman laboratory of physics, Harvard University, U.S.A.

In June there will be two lectures: the first, the Croonian, by Prof. F. M. Burnet, director of the Walter and Eliza Hall Institute, Melbourne, Australia, and the second, the Ferrier, by Prof. J. Z. Young, professor of anatomy, University College, London.

The first Leeuwenhoeck Lecture founded in 1948 by a bequest from Mr. George Gabb "for an annual lecture in the field of microbiology," will be given by Sir Paul Fildes on November 9.

Prof. F. J. Cole, Emeritus Professor of Zoology, University of Reading, will deliver the Wilkins Lecture on December 14.

Liege International Fair

Preparations are now well under way for the International Fair to be held at Liege from April 29 to May 14. The area of the fair will be twice as large as last year's and exhibits will cover all aspects of mining, metallurgy and mechanical and electrical engineering.

IN THE COURTS

IMPORTANT RULING ON PATENTS CLAIMS

Lords Reject Appeal by May & Baker and Ciba

By a majority decision, the House of Lords last week ruled that the petition by May & Baker, Ltd., and Ciba, Ltd., to amend their letters patent relating to sulphanilamide drugs should not be granted and sustained the application of Boots Pure Drug Co., Ltd., that the original letters patent should be revoked. The Law Lords dismissed the appeal by the first two companies against the decision of the Court of Appeal, which had affirmed judgment of Mr. Justice Jenkins in favour of the original petition by Boots Pure Drug Company.

Earlier, May & Baker and Ciba had sought leave to amend the specification for which letters patent were granted on May 24, 1946, so as to restrict the claims to sulphathiazole and sulphamethylthiazole. The specification had related to "the new para-amino benzene sulphonamide thiazoles" which were computed to comprise potentially several million compounds. This was a result of research by the two companies aimed at improving the possible uses of sulphanilimide, the great therapeutic value of which against streptococcal infections had been established in 1935. The motion to restrict the claims was refused in January, 1948, by Mr. Justice Jenkins. That decision was affirmed by the Court of Appeal on the ground that the specification as amended would claim an invention substantially different from that claimed in its original form, and that the Court had no power to allow the proposed amendments.

Insufficiently Specific

Lord Simmons, ruling, in the latest hearing, that the appeal should be dismissed, said there was no hint in the original specification that the exemplary drugs, sulphathiazole and sulphamethylthiazole, were essentially distinguishable from any other members of the vast group within which they fell, or that they had some peculiar characteristic which gave them a therapeutic value. No one could fairly read the document without concluding that their therapeutic value was derived from a generic quality; they illustrated the invention just because they had that quality. No separate claim was made for the manufacture of those two specific drugs, or for the drugs themselves.

The question was whether the invention claimed by the amended specification was different from, and, if so, substantially different from, that claimed by the unamended specification. He emphatically held the view that it was plain commonsense that the inventions were different.

General Ruling

It had been contended on behalf of the appellants "that to limit the claims of a specification to the only form of the invention specifically described in the unamended specification and therein claimed in general terms cannot be to claim a substantially different invention." But it was to beg the question to be determined to say that, in every case in which the patentee had stated the nature of his invention in wide and general terms and then given an illustration of it, he could shift his ground and claim that his invention was not the general but the particular. He could do so only if they were the same inventions.

That problem was to be solved by the consideration of the facts of each case. The Court in the consideration of each question was not to be precluded from inquiring whether the illustration given by the patentee was in fact an illustration of the invention which he had generally described.

Lord Normand and Lord MacDermott agreed with Lord Simmons's decision.

Dissenting Judgment

Lord Morton dissented. He considered that the proposed amendment could be regarded as an amendment by way of disclaimer and was not prohibited by the proviso to section 22 of the Patents and Designs Acts, 1907-46. He regarded the two drugs as being the preferred embodiment of the invention described in the specification. It seemed to him that the appellants were not claiming a substantially different invention, but something which was part of the wide invention originally claimed.

Lord Reid said that he thought that the proposed amendment was competent. But it did not necessarily follow that the appeal must succeed. He was unable to agree that the appeal should be dismissed on the grounds which their Lordships had stated.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

Lautaro Nitrate Co., Ltd., London, E.C. (M., 18/2/50.) December 22, mortgage to La Caja de Accidentes del Trabajo, Santiago, Chile (formerly Labour Accidents Department of National Savings Bank, Santiago, Chile) supplemental to mortgage dated May 4, 1938, and a mortgage dated December 30, 1940, and January 18, 1941, securing 4,321,000 Chilean pesos inclusive of 3.5 million pesos secured by said mortgages; charged on property charged by original mortgages. *£2,645,767. January 12, 1949.

Manchester Oil Refinery, Ltd., (M., 18/2/50.) January 16, deed of indemnity, and debenture securing to G. Tugendhat, London, all sums due or to become due to the holder but not ex. £40,000; general charge. *£650,000. June 28, 1949.

Milner & Coke, Ltd., London, S.E., manufacturers of disinfectants etc., (M., 18/2/50.) January 12, debenture securing to H. E. Lewis, London, all sums which the chargee may be called upon to pay under a guarantee; general charge. *Nil. July 28, 1948.

Viscose Development Co., Ltd., Bromley, Kent (M., 18/2/50.) January 9, £135,000 debenture stock, part of an amount already registered. *Nil. May 18, 1949.

Satisfactions

Classic Chemicals, Ltd., Radcliffe. (M.S., 18/2/50.) Satisfaction January 21, of charge registered November 5, 1946, to the extent of £2000.

Tanks & Linings, Ltd., Droitwich. (M.S., 18/2/50.) Satisfaction January 16, of charge registered September 19, 1947.

Change of Name

The name of Tecto Products, Ltd., has been changed to Factron Products, Ltd.

Company News

Borax Consolidated, Ltd.

A final dividend of 6 per cent, less income tax, plus a bonus of 2½ per cent on the deferred ordinary stock, has been recommended for the year ended September 30, 1949. The company's net profit, after taxation, was £408,667.

Monsanto Chemical Company

Net earnings of the Monsanto Chemical Company (U.S.A. and Canada) in 1949 totalled $17.24 million, as compared with $18.04 million in 1948. Total sales rose slightly from $161.6 million in 1948 to $165.9 million last year.

New Registrations

Cathodic Protection Co., Ltd.

Private company. (478,089). Capital £500. Manufacturers of anti-corrosion, filtering and purifying apparatus and plant, water softening plant and materials, etc. Directors: P. E. Heathfield, A. L. Vandervelde. Reg. office: Oak Tree Lodge, Oxted, Surrey.

Longley Chemicals, Ltd.

Private company. (478,044). Capital £2000. Manufacturers of chemicals, gases, etc. Directors: C. A. Longley, P. A. Blundell, G. N. Ommanney. Solicitors: Yarde and Leader, 1/2, Gray's Inn Place, W.C.1.

Ralph Nye, Biddle & Co., Ltd.

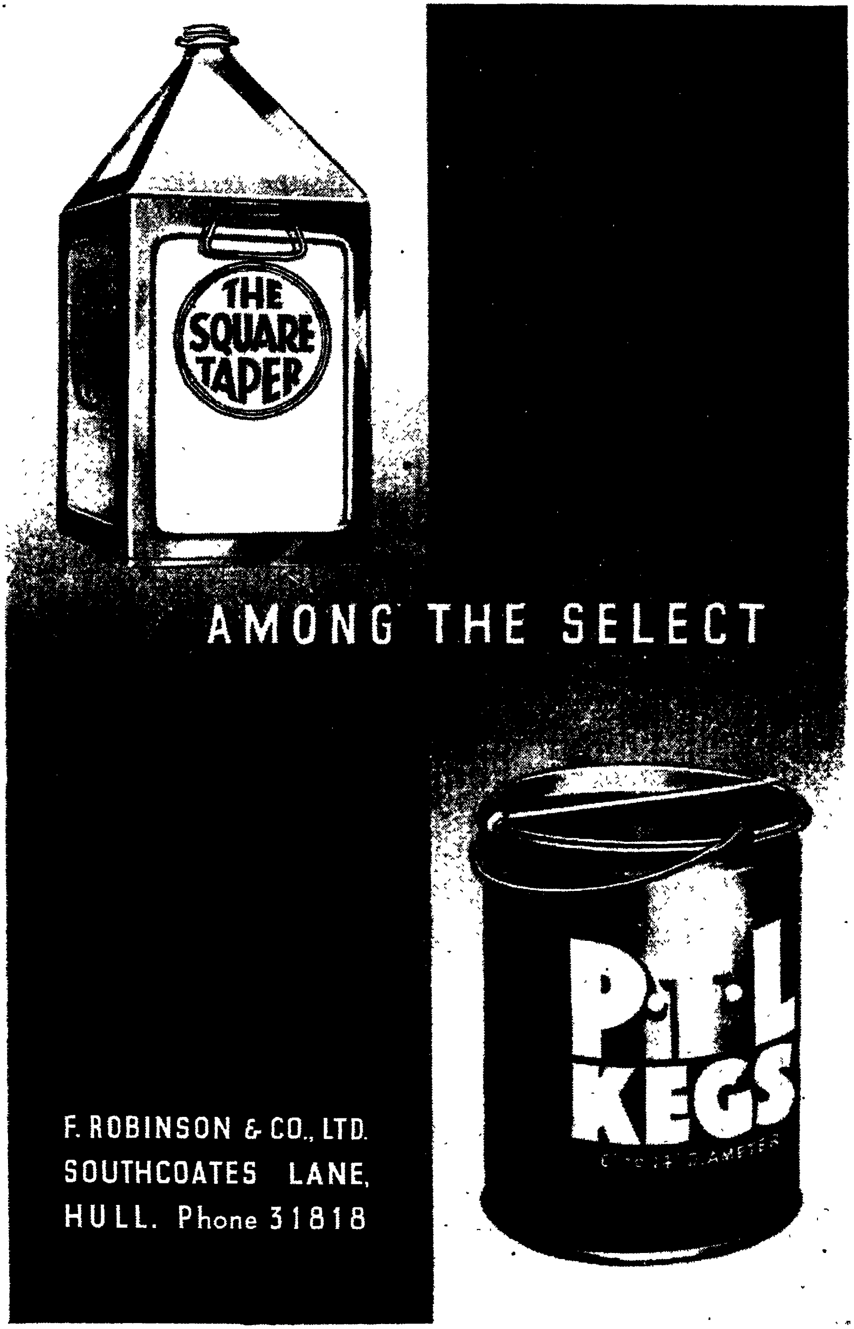
Private company. (478,061). Capital £10,000. Dealers in chemicals, colours and dryers, etc. Directors: R. L. F. Nye, Mrs. A. Nye, H. A. Tobias. Reg. office: Grand Buildings, Trafalgar Square, W.C.2.

R. Sarant & Co., Ltd.

Private company. (478,202). Capital £5000. Manufacturers and refiners of oils and oil substances of all kinds, chemicals, spirits, gums, fats, etc. Directors: R. Sarant, G. de M. Logsdon. Reg. office: Sardinia House, Sardinia Street, London, W.C.2.

Sunray (Birmingham), Ltd.

Private company. (477,990). Capital £8000. Objects: To adopt an agreement between Sun-Ray (Bleach), Ltd., and A. Plummer and G. Gammon; and to carry on the business of manufacturers of bleaching and cleaning products, washing and cleaning powders, soap, etc. Directors: N. A. Plummer, D. G. Gammon. Reg. office: 47, Temple Row, Birmingham.



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The Stock and Chemical Markets

THERE has been little improvement in the volume of business in stock markets affected by General Election uncertainties. The feature in industrials was a further moderate rally in shares of companies which would not be threatened with nationalisation if there were a change of Government.

Imperial Chemical have been more active around 41s. 4½d., attention being drawn to the attractive yield and to expectations that the 10 per cent dividend will be maintained. Monsanto 5s. ordinary were firm at 50s. 7½d. helped by news of the group's Indian plans. Fisons, however, receded further to 21s. 10½d. Laporte Chemicals 5s. ordinary have shown firmness at 9s. 6d., and Brotherton 10s. shares were 19s. 4½d. Albright & Wilson were 28s. 9d. British Glues & Chemicals 4s. shares held firm at 20s., and British Oxygen rose further to 92s. 6d. in anticipation of the announcement of excellent results for the past year and talk of a substantial issue of shares, probably on bonus terms, to shareholders.

Borax Consolidated, after receding to 54s. 6d., firmed up to 55s. on further consideration of the financial results. Turner & Newall were good again, changing hands up to 79s. 3d., sentiment still being influenced by the chairman's statement that it is not intended to continue dividend limitation.

Associated Cement have rallied to 73s. 6d. and British Portland Cement to 71s. 10½d. Among paints, Lewis Berger showed firmness at 25s. 6d. Pinchin Johnson at 36s. 7½d. have held their recent improvement, in expectation that the dividend may be maintained, despite the larger capital. Swedish Match reflected the general local advance, rising to 49s.

The 4s. units of the Distillers Co. have been fairly steady at 17s. 1½d., De La Rue were 28s., British Industrial Plastics 2s. shares 4s. 7½d., and British Xylonite 57s. 6d. Metal Box shares have been favoured up to 90s., the market assuming that this is an instance where these would be good prospects of a higher payment for shareholders if dividends limitation were abolished. Elsewhere, however, General Refractories have eased to 22s. 9d.

Glaxo Laboratories have been firmer at 14s. 10½d., and shares of other companies which have distributed share bonuses in recent months were also inclined to strengthen.

United Steel have improved to 27s. 4½d., Stewarts & Lloyds to 53s. 6d. and Dorman Long to 32s. 3d., all of which are well below the take-over prices fixed in the event of nationalisation.

Boots Drug have improved to 48s., Triplex Glass kept steady at 18s., and Lever & Unilever firmed up to 40s. 6d. Oil shares, after firming, were inclined to ease on the news that the U.S.A. is still dissatisfied with Britain's compromise on the question of oil imports from dollar countries. Shell eased to 63s. 9d., and weakness of Ultramar Oil at 7s. was a feature.

Market Reports

THERE have been no changes of importance in the market for industrial chemicals and prices have remained steady with a firm undertone. An active export is reported and home consumers' delivery specifications have covered good quantities, but strictly new business has been on a moderate scale and mostly to meet spot or nearby requirements. Reports indicate that buyers are awaiting the results of the General Election before placing further contracts. The supply position in the soda products section remains fairly easy with chlorate of soda firm on a steady demand. The potash compounds remain on a firm price basis and there is a ready outlet for most items. With the possible exception of xylol all the coal tar products are in plentiful supply and the tone generally has been quiet and unchanged.

MANCHESTER.—From the point of view of actual deliveries, steady trading conditions have been reported in Manchester during the past week. The cotton, woollen and other textile industries are calling for substantial contract deliveries of a wide range of heavy chemicals, and similar instructions from the majority of the other principal consumers are reported to be circulating satisfactorily New bookings on home trade account and also for export have been fairly substantial. There has been little change in the price position. A steady movement of supplies of tar products is reported, with cresylic acid still relatively quiet.

GLASGOW.—The Scottish chemical market has been fairly active during the past week, and the volume of turnover has been higher than for some time. Trisodium phosphate is at present in short supply owing to recent heavy bookings. The export position has also shown considerably more activity and some very good orders have been booked for the Continent.

Patent Processes in the Chemical Industry

Complete Specifications Accepted

Process for the flocculation of solids in aqueous suspensions.—Directie Van De Staatsmijnen in Limburg, Handelend Voor En Namens Den Staat Der Nederlanden. Oct. 18 1946. 634,440.

Methods and agents for preparing aqueous solutions of water-insoluble substances.—Taubmans, Ltd. Jan. 6 1947. 634,499.

Chemical reactions involving the evolution of fumes of oxides of nitrogen.—Johnson & Sons' Smelting Works, Ltd., and T. Critchley. Feb. 4 1948. 634,578.

Manufacture of metal nitrates.—Johnson & Sons' Smelting Works, Ltd. and T. Critchley. Feb. 4 1948. 634,579.

Process and catalyst for the dehydrogenation of olefins.—A. Abbey. (Dow Chemical Co.) Feb. 28 1947. 634,391.

Process and catalyst for the dehydrogenation of aliphatic mono-olefins.—A. Abbey. (Dow Chemical Co.) Feb. 28 1947. 634,580.

Emulsion polymerisation. — Wingfoot Corporation. March 8 1947. 634,503.

Production of acetals of β-haloaldehydes.—General Aniline & Film Corporation. April 16 1947. 634,581.

Process for the production of iron powder.—International Minerals & Chemical Corporation. April 18 1947. 634,582.

Electrodeposition of nickel from an acid bath.—Udylite Corporation. April 19 1947. 634,394.

Process of refining chloral by distillation.—L. E. Jones. (Shawinigan Chemicals, Ltd.) April 22 1947. 634,398.

Stabilisation of vinyl and vinylidene chloride resin compositions.—British Resin Products, Ltd., F. S. Deutsch, and L. H. P. Weldon. April 20 1948. 634,669.

Cuprous powder and method of making the same.—F. B. Dehn. (H. H. Robertson Co.) May 1 1947. 634,399.

Process for the treatment of petroleum hydrocarbon and synthetic lubricating oils which are corrosive to copper.—Standard Oil Development Co. May 20 1947. 634,402.

Fluorinated olefin polymers.—California Research Corporation. June 2, 1947. 634,673.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order

CHEMICAL ENGINEERS. The Civil Service Commissioners invite applications for permanent appointments as **PRINCIPAL SCIENTIFIC OFFICER** and **SENIOR SCIENTIFIC OFFICER** at the Atomic Energy Research Establishment, Harwell, near Didcot, Berks.

Duties are in research groups dealing with pilot plant development of the wide range of chemical processes associated with the development of atomic energy and for fundamental research in the unit operations involved.

Candidates must possess a 1st or 2nd Class Honours Degree in Chemical Engineering, or equivalent professional qualifications, or a 1st or 2nd Class Honours Degree in Chemistry, Physics or Mathematics. At least three years' appropriate Post-Graduate or other experience is required, of which at least one year should have been in Chemical Engineering or Applied Chemistry. Experience in the development of processes from the laboratory to the pilot and full scale, using theoretical in preference to completely empirical design methods, will be an advantage.

Salary Scales: Principal Scientific Officer (male), £910-£1,177; Senior Scientific Officer, £670-£860. Rates for women somewhat lower. Posts carry benefits under Federated Superannuation System for Universities.

Candidates must have been born on or before 1st August, 1919, but the Senior Scientific Officer posts (and similarly graded scientific posts in other Government Departments) are also open to candidates born between 1st August, 1924, and 2nd August, 1919 (inclusive), through the Open Competition under Normal Regulations already announced (No. 2887).

Further particulars and application forms from the SECRETARY, Civil Service Commission, Scientific Branch, 7th Floor, Trinidad House, Old Burlington Street, London, W.1. Applicants should state their date of birth and quote No. 2951. Completed applications must be returned by 7th March, 1950.
5656/100 JD

CHEMIST required for Lancashire Speciality Paper Mill, to take full charge of laboratory and development work. B.Sc. or equivalent qualification and/or previous paper mill experience essential. Full particulars to Box C.A. 2901, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

THE MINISTRY OF SUPPLY invites applications for the following appointment in the Division of Atomic Energy (Production), Springfields Factory, Salwick, near Preston.

ASSISTANT WORKS MANAGER, to be responsible to the Works Manager for the operation of the plant in a large chemical factory. Candidates must have an Honours Degree in Chemistry or Associateship of the Royal Institute of Chemistry or equivalent qualifications, together with several years' experience of chemical plant operation in industrial processes involving toxic hazards. Experience in the management of labour is essential.

Salary will be assessed according to qualifications and experience, within the range £1,000-£1,400 per annum.

Candidates will normally be confined to natural born British subjects born within the United Kingdom or one of the Self-Governing Dominions and of parents similarly born.

Applications should be sent to ADMIN. BRANCH, D.AT.EN.(P), Risley, near Warrington, Lancs.
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The Chemical Age

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Volume LXII 25 February 1950 Number 1598

Atomic Power and Chemists

FOR reasons that have never been satisfactorily explained, little more than smatterings of information have been revealed in this country about the progress of atomic fission. The bomb and all that it represents has overshadowed the prospects of harnessed atomic energy. A lecture recently given by Dr. Hafstad, director of reactor development at the U.S. Atomic Energy Commission, to the American Institute of Chemical Engineers (*Chemical Industries*, *66*, 28-29) has lifted a corner of the uranium curtain. The prospect of atomic power is still remote and even if physicists succeed in developing atomic fuel reactors the practical and economic operation of these power units will depend upon chemists and chemical engineers.

One type of reactor being developed by the U.S. Atomic Energy Commission is what is known as a breeder reactor. The breeding conception has in it something like perpetual motion, for its aim is the production of more fissionable material than is initially consumed as fuel. Uranium has the two natural forms, U-238 and U-235, of which only the latter is fissionable. If excess neutrons from the fission of U-235 are captured by U-238, then U-238 can be converted into plutonium, which is fissionable. Converters operated so far have, unfortunately, produced smaller amounts of plutonium than the original amounts of U-235. The wastage of neutrons in practice conflicts with the theory that sufficient should be released from U-235 atoms to provide a "profit" in fissionable atom production. The possibility of breeding emerges from this idea, converting uranium-238—of which there is an adequate supply—into more and more plutonium. U-238, says Dr. Hafstad, is approximately 140 times more plentiful than U-235.

Developing such a breeding process is clearly a long-term assignment for atomic physicists. Their problem is to eliminate the wastage of neutrons in the conversion process. But even if they succeed, there will be a further wastage factor to be overcome—the reprocessing of the fuel elements themselves. This kind of "fire" also produces waste, which must be periodically removed to keep the fire going. These "ashes" are the chemical products of fission, radioactive elements close to barium in the periodic table. It is here that the chemist must make his contribution before atomic energy can be harnessed

On Other Pages

Leader:

Atomic Power and Chemists . . 283

Notes and Comments:

Overseas Trade Trends . . 285
Chemical Work at Harwell . . 285
Adventure in the Laboratory . . 285
Aluminium Parade . . 286
Britain's Largest Atomic Pile . . 287
Isotopes in Industry . . 288
Shell Haven Refinery . . 288
Thirty-four New ARIC's . . 288
Future of I.G. Farben . . 289
Overseas Trade Totals . . 289
Fertiliser Expansion Plans . . 289
Potentialities of Titanium . . 290
French Lead for U.K. . . 290
Gelatin and Glue Research . . 291
Foreign Studies of Colloid Effects . . 294
Insecticides in Treated Foodstuffs . . 295
Helium Engineering . . 297
Basis of New Fluorinated Materials 298
The Minor Constituents of Coal . . 299
S. Africa's New Production Programme . . 303
A Chemist's Bookshelf . . 305
Electrodepositors' Jubilee . . 308
Chemical Engineers' Meetings . . 308
Prices of British Chemical Products 311
Balkan Trade Pending . . 317

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

for peaceful power. The fuel elements have to be withdrawn from the reactor, chemically cleaned, remade, and replaced. This represents as large an economic factor of loss as the present U-235 neutron wastage in conversion of U-238 into plutonium. In Dr. Hafstad's own words: "It pains me to see carefully fabricated and machined parts, products of many hours of highly skilled work, casually dissolved in acid to start the chemical purification."

Chemical engineers have already put forward entirely new ideas. They have suggested that the present design of reactors, with their fuel elements embedded in other cooling and protective materials, might be constructed homogeneously, with the fuel elements placed in solutions or even surrounded by modern fluidised solids. Design of this nature would help to eliminate the costly and cumbersome fuel element removal and purification. Dr. Hafstad made it clear that this type of reactor, though at present no more than a blue-print speculation, will characterise an important section of future American research. Meanwhile four reactors of the heterogeneous type are under construction, and it is significant that most progress has been made in building an experimental "fast breeder" at the Reactor Testing Station in Idaho. Although these types of reactor present such serious cleaning problems, it may reasonably be expected that experience gained from their pilot operation will provide a starting point for the construction of homogeneous reactors.

To those of us who must stand outside this new and secret branch of science and who can rely only upon occasional glimpses of progress in forming our opinions one thing seems abundantly clear. It must be many years before man's power to split the atom can be converted into controllable industrial power at an economic cost. Here, indeed, is the very substance of difference between war and peace. War is an uneconomic venture, and only when cost was disregarded amid the atmosphere of world war was it possible to develop U-235 into an atomic bomb. Huge processing wastages had no other comparative background save those other wastages of war which the unilateral possession of the same weapons might eliminate. How very different is the project of turning U-235 into a final

(continued on page 286)

Notes and Comments

Overseas Trade Trends

THE capacity of chemical industries to handle and negative most of the possibly disturbing effects of a change as fundamental as the devaluation of the £ is attested by the summaries of chemical import and export trading in the first month of the year. The new exchange rates have necessarily substantially raised values of some essential imports, such as sulphur and carbon black from the U.S.A., and occasionally rendered our export prices more competitive. Yet the swing in import and export totals in January was less marked than was thought likely when devaluation was first effected. Imports of the main categories of chemicals, drugs, dyes and colours (excluding sulphur) cost £2.6 million compared with £2.17 million in January a year ago; exports showed a relatively small reduction (some £278,000) in the total of £7,934,581. Of greater importance, in its conspicuous effect on the export picture, is the acute curtailment of chemical sales to India. These, in January last year, produced £1.47 million. Their total last month is recorded as £223,495. Far less disturbance has, of course, occurred in our smaller trade with Pakistan. The loss of Indian trade, should it prove to be irrecoverable, cannot fail to render remote the prospect of reaching the £9 million monthly export target formerly suggested for chemical industries.

Chemical Work at Harwell

THE long-standing criticism that chemical industry is prone to carry secretiveness to exaggerated lengths whether there is good reason for concealment or none has found another target in the Atomic Energy Research Establishment, the subject last week of a Press information note which was more provocative than revealing. The possibility that the larger pile at Harwell—whose operation during its first 12 months was dealt with—may already have revealed means of producing in materials chemical and physical changes of profound scientific and industrial interest is suggested, but in the absence of even elementary data the importance of this must be left to conjecture. " Many chemical reactions," says the Ministry of Supply, can be induced by nuclear radiations, of which BEPO provides an enormous source. Reactions which normally occur only at the highest temperatures obtainable in a furnace sometimes take place at ordinary temperatures inside the pile." That alone gives rise to a dozen questions—to which, it need hardly be said, there will be no answer at this stage, unless the more liberal policy by the American AEC should happen to provide it. It is not to be supposed, however, that the method of producing these fundamental changes within the pile has been reduced to a science. The brief information from Harwell does reveal that there is uncertainty there as to the source of particular chemical effects occurring in the presence of mixed radiation of neutrons and gamma rays. Some of the work with the large pile is now directed to distinguishing these effects, presumably with the view to their controlled application—one day.

Adventure in the Laboratory

MUCH has been written and spoken about the application of scientific knowledge to industry, but it was refreshing to hear Sir Ben Lockspeiser emphasise an aspect of the matter which has tended to be overlooked amid the preoccupation with finance, administration and the like. The secretary of the DSIR, opening the new laboratories of the British Non-Ferrous Metals Research Association last week, said: " We must never lose sight of the necessity to maintain our scientific capital. Science also has its gold reserves, and if they fall too low, technology loses the source of its sustenance. Every good laboratory must keep a workable balance between the effort it gives to the getting of new knowledge and that it gives to applying what we know." Sir Ben went on to point out that the spirit of courage and good judgment in science could often produce startling results. A spirit of adventure and eagerness—even to the extent of breaking rules occasionally—was one of the distinguishing characteristics of a flourishing laboratory. Here indeed is the key to successful investigation, for without personal initiative, quick decisions and an ability to see great results from small beginnings, scientific research would cease to attract the great wealth, of men and money, which it still commands, more especially in its industrial divisions.

Aluminium Parade

ALUMINIUM'S emergence from the war-time category of materials reserved for strategic purposes only has been celebrated by increasing uses, some of which now seem to verge on prodigality. That is the first impression derived from the knowledge that aluminium is the chosen constructional material for two of the large forthcoming exhibitions in London—for the vast Dome of Discovery which is to house much of the review of science in industry at the Festival of Britain, and more immediately as the main structural feature of this year's Ideal Homes Exhibition. Aluminium will be very much to the fore at the Olympia exhibition, in the form of an arch 75 ft. high and 100 ft. wide at the base, linked with avenues and pavilions spanned with aluminium tracery. It is believed that the arch alone will require about 12 tons of aluminium alloys, sufficient to supply for a considerable time one or other of the innumerable industrial uses of aluminium. The apparent prodigality will be compensated, from the point of view of aluminium producers, by the spectacular publicity for the metal, for the dome and the arch will be larger than anything of the kind attempted outside the aeronautical field. The company supplying the Ideal Homes spectacle are reassuring on the point. When the exhibition closes, they say, about 50 per cent of the metal will be capable of re-erection when similar need arises. The other half will be recovered as salvage and, after reprocessing, may find its way back to industry, where in view of the steadily expanding uses it seems more properly to belong.

ATOMIC POWER AND CHEMISTS

(continued from page 284)

source of power to compete with coal, oil, or hydro-electricity.

Nevertheless, there is some perverse consolation in the fact that the post-war atomic arms race is not fast or easy. In the present state of man as a political animal, the Gargantuan costs of atomic development may be in effect a safety device. Mankind may find one day that it cannot afford to blow itself to pieces. To point this lesson, radioactive isotopes, by-products principally of the nuclear reactors, which are already serving science and technology, are cheap. Confidence that they may begin to make their contribution in the British industrial field has now been attested by the formation of at least one company to promote their fuller use.

C.A. Issues Sought

THE City of Johannesburg public library authorities are urgently seeking to acquire, as a gift or by purchase, a number of past issues of THE CHEMICAL AGE which are missing from their file and are now out of print. The South African library has asked THE CHEMICAL AGE to invite the collaboration of its readers who may have duplicate or unwanted copies. The issues required are these:—

Vol. 4: Nos. 81, 84, 87, 88, 91, 92, 93, 95. 96, 98, 99, 100 (1921).
Vol. 7: No. 167 and index (1922).
Vol. 8: Nos. 186, 192 and index (1923).
Vol. 9: Index (1923).
Vol. 10: No. 263 and index (1924).
Vol. 11: Nos. 265, 266, 267, 268, 278 and index (1924).
Vol. 12: No. 290, 311 and index (1925).
Vol. 13: Complete and index (1925).
Vol. 44: No. 1126 (1941).
Vol. 45: Nos. 1167, 1168, 1169, 1170 (1941).
Vol. 46: Nos. 1180, 1182, 1199 and index (1942).
Vol. 47: No. 1220 (1942).
Vol. 51: No. 1312 (1944).

BRITAIN'S LARGEST ATOMIC PILE

Only Four per cent of Radioisotopes for Industry

PASSING references to some of the important effects being produced developing the uses of Britain's largest atomic pile, BEPO, are made in the latest information issued by the Ministry of Supply. It briefly summarises the first year's work with the second pile at Harwell. (BEPO started up on July 3, 1948.) The next few months, records the Ministry, were spent on initial tests, and production of radioisotopes began and Feb. 28, 1949.

The report shows that in November last year the large pile produced 338 samples of radioisotopes (the elements are not mentioned) which were distributed and used in these proportions: medical uses 173, universities 30, industry 13; air deliveries overseas 57; internal use at AERE 65. Industry thus employed less than four per cent of the total.

Improved Uranium Cartridge

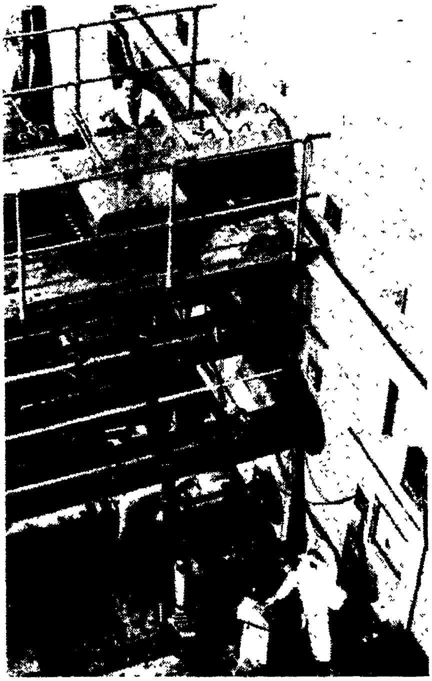
Experience during the first year is said to have enabled the metallurgy and engineering divisions to develop an improved uranium cartridge, cased in aluminium, which can resist a higher temperature than those at present in use. It is anticipated that when the improved cartridges are loaded into the pile it will be possible to increase considerably the energy available in the pile, and so extend the scope of experimental work.

BEPO is being used for three main purposes: the production of radioisotopes; studies of the effects of neutrons and gamma rays on materials; and experiments in nuclear physics and neutron diffraction.

One of the most interesting passages in the short report by the Ministry relates to physical and chemical changes in materials effected by irradiation within the pile in which there are 40 holes made to receive experimental specimens. Many chemical reactions, it is noted, can be induced by nuclear radiations, of which BEPO provides an enormous source. Reactions which normally occur only at the highest temperatures obtainable in a furnace sometimes take place at ordinary temperatures inside the pile.

The report gives no indication of the materials in which such chemical changes have been induced, and it refers to the uncertainty existing as to the source of these effects, because the pile sets up a complex of neutrons and gamma rays of varying proportions and energies. Some of the chemical investigations at Harwell are to distinguish these effects and to determine the results of varying the energy and intensity of the rays.

For most of this work, states the Ministry, a narrow beam of neutrons is allowed to escape from the centre of the pile through a small hole in the concrete and steel shield. These beams are used to study the precise characteristics of various nuclear reactions, such as the process of fission itself.



[Crown copyright

Through the lead tunnel, mounted on the platform, come the irradiated materials from the pile, one face of which is shown here. The radioactive isotopes in their aluminium cans are ejected from the tunnel by plungers (near the operator's right hand) and fall down the sheathed tubes into the shielded mobile container below. In the large horizontal tubes are the cadmium control rods regulating the intensity of the chain reaction

ISOTOPES IN INDUSTRY

Commercial Developments

THE Ministry of Supply has co-operated in the selection from the Atomic Energy Research Establishment, Harwell, of staff for the newly incorporated company, Isotope Developments, Ltd. (THE CHEMICAL AGE, 62, 244), believed to be the first commercial firm to act as consultants and suppliers of radioactive isotopes for industry and agriculture.

The technical staff is headed by Mr. K. Fearnside, and the chairman is Mr. R. D. Peters.

The following are practical examples of the type of problems of interest to the chemical and associated industries which can be solved by the application of radioisotopes and with which the new company will concern itself.

A Beta gauge for measuring and controlling the basis weight of sheet material, particularly plastics; the measurement and control of the thickness of coating applied to a metal, as for example, chromium plating on steel; determination of impurities in compounds more accurately than is possible by spectrographic means, when the impurities are present in extremely small quantities, as for example, arsenic in germanium.

Determination of losses of valuable constituents in normal working processes; and the elimination of static electricity from handling processes involving dry material, as for example, explosive substances or plastic sheet.

SHELL HAVEN REFINERY

Large-Scale Petroleum Engineering

CONSTRUCTIONAL work on the Shell Haven refinery, near Southend, Essex, is reported to be progressing at a rate which should ensure its readiness to start to operate in November, 1950.

A tunnel, 9 ft. in diameter, is being built 50 ft. below the Thames. Extending 900 ft., it will carry cooling water from the river to the refinery site. Miners, working 8-hour shifts, are moving forward at the rate of about 100 ft. a month.

A water pumphouse, 250 ft. by 50 ft., with the main pump units assembled 80 ft. below ground level, will service the process area with the cooling water. Eventually, units will be installed to deliver water at the rate of at least 80,000 g.p.m.

The Shell Haven and Stanlow refineries will together handle more than 6 million tons of crude oil yearly to produce a complete range of finished petroleum products. The labour force at Shell Haven, now 2200 strong, will eventually be increased to 3000.

The first distillation plant will be commissioned to process a planned intake of 6000 tons a day of crude oil. Notable features of this plant include a high degree of control by instrumentation and the almost complete elimination of steam for operating pumping units, most of which will be electrically driven.

A reforming unit, to process some 1200 tons of naphtha a day, is due to be in full operation by May, 1951.

Thirty-four New Associates of the RIC

NEW Associateships of the Royal Institute of Chemistry have been announced as follows in the Pass List for the January examinations:

BENSON, Gerald Bernard, B.Sc.(Lond.), South-East Essex Technical College, Dagenham; **CASAJUANA**, Brian Eric, B.Sc. (Lond.), Nottingham and District Technical College; **CORDES**, Miss Elsa Mary, B.Sc.(Lond.), Northern Polytechnic, London; **DAVIES**, Glyn, B.Sc. (Lond.), College of Technology, Manchester, and Royal Technical College, Salford; **FAIRWEATHER**, John Henry, Technical College, Cardiff; **FEATHERSTONE**, Arthur Andrew Valentine, Municipal Technical College, Widnes; **FITCH**, George Roy, B.Sc.(Lond.), Wolverhampton and Staffordshire Technical College, Wolverhampton; **FOGDEN**, Eric Reginald William, Municipal College, Portsmouth; **FOXLEY**, Donald, City College of Technology, Liverpool; **HOCKEY**, Cyril Victor, Chelsea Polytechnic, London, and Technical College, Huddersfield; **HOCKINGS**, Eric Francis, Technical College, Brighton; **HUDSON**, Harry Robinson, Municipal Technical College, Hull; **JONAS**, Donald Moore, **KIN**, Leslie, and **LAND**, John Robert, City College of Technology, Liverpool; **MACDERMOTT**, Philip Eric, B.Sc.(Lond.), Royal Technical College, Salford; **MALIN**, Leonard, B.Sc.(Lond.), Municipal Technical College, Hull; **MATHER**, Eric, College of Technology, Manchester, and Royal Technical College, Salford; **MILMAN**, Francis Leonard, City College of Technology, Liverpool; **MORRIS**, Neville John, Royal Technical College, Salford; **MOVERLEY**, Stuart, Municipal Technical College, Hull; **NEWTON**, Rex James, The Polytechnic, Regent Street, London; **PHILLIPS**, James Ivor, and **PHILLIPS**, Kenneth Albert, City College of Technology, Liverpool; **REYNOLDS**, George Frederick, B.Sc.(Lond.), Medway Technical College, Gillingham; **RICHARDS**, Maurice George, Municipal College, Portsmouth; **RUSSELL**, Harold James, B.Sc.(Lond.), South-East Essex Technical College, Dagenham; **SILVER**, Derrick John, Denbighshire Technical College, Wrexham, and South-West Essex Technical College, Walthamstow; **SOUTHGATE**, Norman Arthur, B.Sc.(Lond.), Woolwich Polytechnic, London; **STRIPE**, James Thomas Stanley, Northern Polytechnic, London; **TAYLOR**, Miss Muriel Margaret, Morecambe and Lancaster Technical College, Lancaster; **THOMAS**, David Heury, College of Technology, Manchester, and Wigan and District Mining and Technical College; **TINDALE**, Leslie, Municipal Technical College, Hull; **WILLIAMS**, Edward, B.Sc.(Lond.), City College of Technology, Liverpool.

OVERSEAS TRADE TOTALS

Chemical Exports Nearly £8m.

EXPORTS of chemicals, drugs, dyes and colours in January reached a total value of £7,934,581 compared with £8,212,770 in the same month of 1949, and £6,756,587 in 1948. The totals of various groups showed increases over the previous month. Some characteristic increases were these (December, 1948, figures in brackets): chemical manufactures (excluding drugs and dyestuffs) £4,308,214 (£3,888,325); drugs and medicines £1,756,256 (£1,587,859); dyes and dyestuffs £746,899 (£644,471); paints and pigments £1,123,212 (£921,194).

After a reduction in the first month of last year, compared with the same period of 1948, the value of imports of all chemicals, drugs, dyes and colours in January was again higher. Comparative figures were: £2,609,934 (1950); £2,175,503 (1949) and £2,252,087 (1948). In addition, 32,285 tons of sulphur from the U.S.A. accounted for £307,176.

Gas and chemical machinery imports during the month were more than four times greater than 1949 and represented a total value of £95,112 compared with £22,965.

Details of export and import figures from the *Trade and Navigation Accounts of the United Kingdom*, January, 1950 (HMSO, 6s. 6d.) from which the figures above are abstracted, will appear in our next issue.

Fertiliser Expansion Plans

"THE greatest programme of expansion and modernisation ever undertaken by the industry," was how Mr. F. G. C. Fison, chairman of Fisons, Ltd., described his company's response to the Government's appeal in 1944 that the fertiliser industry should put forward plans for increased production.

When the company's projects were completed in about 12 months' time, annual productive capacity of sulphuric acid would be increased by 120,000 tons, of superphosphate by 90,000 tons, of granular complete fertilisers by 450,000 tons.

70,000 tons a year of triple superphosphate would also be produced, a fertiliser which had not hitherto been manufactured in this country. The cost of the complete programme would be £5.5 million.

Mr. Fison was speaking at the annual meeting of the company in Ipswich.

FUTURE OF I.G. FARBEN

Capacities and Use of Assets

THE unfailing interest concerning the future of the I.G. Farbenindustrie group, especially in the Federal German Republic, lends added importance to an investigation written by Dr. Hermann Gross, of the Institute for World Economy, Kiel University. This paper gives fairly full data about the turnover and number of workers of the various units of the group, in particular about the three major units which are to be established as a result of the liquidation of the I.G.

Fixed assets of the I.G. are reported to have amounted to a book value of RM.1.95 milliard on September 30, 1944; of this 57.9 per cent or RM.1.13 milliards are accounted for by units situated outside the Federal German Republic—more than half a milliard RM. in the Soviet Russian zone and in the Russian sector of Berlin.

Dr. Gross states that 33.6 per cent of the value of fixed assets will be accounted for by the proposed three new units: the Badische Anilin- und Sodafabrik, Ludwigshafen-Oppau, the Farbenfabrik Bayer in Leverkusen (which also has plants in Elberfeld, Uerdingen and Dormagen) and the Farbwerke Hoechst (with other works in the neighbourhood of Frankfurt). Individual shares of these three proposed units are:— 18.8 per cent.; 8.5 per cent; and 6.8 per cent respectively.

In the last financial year (July 1, 1948, to June 30, 1949) the proposed Leverkusen unit (Bayer) had the biggest turnover—DM.280 million, and the number of persons employed totalled 25,800. The turnover of Ludwigshafen amounted to DM.162 million and the number of employed to 21,900, while the figures for Hoechst were: DM.150 million, employing 12,800.

In 1938, the I.G. employed 218,000 persons and had a turnover of RM.2.2 milliard and the figures for 1943 are 333,000 employees and a turnover of RM.4.13 milliard. These figures indicate that the proposed three new units would be less powerful than the former I.G. but would still remain sufficiently influential to make unwise any relaxation of watchfulness on the part of the Allies.

More German Plant as Reparations

The Buna research and testing plant belonging to Chemische Werke Huels, G.m.b.H., Maal-Recklinghausen, has been indicated by the High Commission in Germany as being available as reparations.

POTENTIALITIES OF TITANIUM

Sir Ben Lockspeiser on British N-F Metal Research

SOME of the valuable results of investigations carried out by the British Non-Ferrous Metals Association were called to mind by Sir Ben Lockspeiser, secretary of the Department of Scientific and Industrial Research, when he opened the association's laboratory extensions last week.

One of the main problems long associated with the use of metals was corrosion, said Sir Ben. A great deal of credit for freeing ships of the Royal Navy from trouble due to corrosion of condenser tubes could be attributed to the association. Its work had established the beneficial effects of iron and manganese in the cupro-nickel tube and had also demonstrated the merits of a new condenser tube material, namely, aluminium-brass.

Quality control in manufacture was of great importance, and the lead industry had invited the co-operation of the association in a study of commercial production plant with a view to defining the conditions under which control of the quality of the product could be more readily secured in practice.

Workshop Studies

Investigators of the association had spent nearly a year in the members' works studying production methods. To form a sure basis of progress it had been found that more basic knowledge was necessary.

This had meant installation of equipment to deal with work of a larger scale than was normally possible, and this could be seen in the basement of the new laboratory. The association could now use in the 500-ton hydraulic press a sub-press on which lead billets 6 in. long and 6 in. diameter could be extruded under controlled conditions and the precise effect of certain variables ascertained.

Much new ground was being covered by the association and one of the most important items was the study of the properties of titanium, hitherto a comparatively neglected metal. Its density is not much more than half that of steel and it has a very high melting point—over 1700°C.

Metals that are not too heavy and yet can maintain a high strength at high temperature were being increasingly required —for example for gas turbine blades and combustion chambers generally.

The association had shown, contrary to general belief, that the strength of this metal could reach a value of nearly 70 tons p.s.i. combined with good ductility, and this did not require a high degree of purity.

Sir Ben showed a specimen which contained a considerable proportion of carbon and iron, but yet had a tensile strength between 60 and 70 tons p.s.i. Alloys, he pointed out, might do even better than this.

Titanium was abundant and widely distributed in the form of its oxide. It was at present comparatively expensive to make, continued Sir Ben; but it should be remembered that when aluminium was first made it cost 17s. per lb. with the value of a shilling as it then was, whereas the price now was only 1s. per lb.

The present expense of the material need not be discouraging. " All work of this character is a bit of a gamble," concluded the speaker, " but so are all adventures. We have to have courage in our science as in other forms of activity; and, if courage is combined with good judgment, we often get startling results. We must always be prepared for the unexpected, even though it may be a source of embarrassment when it occurs, because it is the unexpected things which often lead to a revolution."

Finally, Sir Ben referred to the right kind of spirit necessary in the laboratory where people should be encouraged to be courageous, and even break a few rules now and again if the spirit moved them. Under its director Dr. G. L. Bailey, he felt confident that the association's laboratory was a healthy one and would continue in its good work for industry.

French Lead for U.K.

ACCORDING to reports from Paris, the Société Minière et Métallurgique de Penaroya has concluded an agreement with the Ministry of Supply for the delivery of 18,000 tons of lead. The first shipment of 6000 tons is stated to have been made already and the company expects to deliver 1000 tons per month during the current year. The French company has promoted a rapid expansion of the lead and zinc mining activities of one of its Moroccan subsidiaries, the Société des Mines de Zellidja, using Marshall Aid funds Repayment of the credit of $3.6 million is to be effected by lead and zinc shipments for the U.S. strategic stockpile.

GELATIN AND GLUE RESEARCH

Wide Scope and Objectives of the New Association

FEW industries offer a wider field for research or one relatively so undeveloped as glue and gelatin production. The need for collective research has long been recognised, so that ready support was found for the British Gelatine and Glue Research Association when it was established with the support of the Department of Scientific and Industrial Research on June 30, 1948.

The scope for research in the gelatin and glue industry extends from the raw materials used in production to the methods of manufacture and the uses of the finished products. From the nature of the industry the research programme may also be considered to include by-products.

Gelatin and bone glue are entirely separate products, made by different processes. Hide glue is produced both incidentally in the course of gelatin manufacture and also by processes closely similar to those for gelatin. Both sectors of the industry are closely linked and manufacture their products almost entirely from waste materials.

Gelatin and hide glue are produced mainly from waste material supplied by tanneries, the best for gelatin manufacture being limed trimmings and pieces that are unsuitable for the leather industry. Local supplies of unlimed scrap are supplemented by the importation of a certain amount of materials such as dried sinews from India and the Argentine, which can be produced only in hot, dry climates.

Ossein

Another material for gelatin manufacture is ossein, which is obtained by removing all the inorganic constituents of bones with acid. Ossein is sometimes imported from Belgium, where hydrochloric acid is cheap.

The materials for the production of high-grade gelatin are usually pre-treated for about 12 weeks in a lime suspension. To improve the distribution of lime among the skins, the contents of the pits are periodically agitated and the liquor run off and replaced by fresh water and lime. This pre-treatment lowers the temperature at which gelatin can be extracted from the hide, and so limits the degradation caused during extraction. The clearness of the finished gelatin depends on the elimination of unwanted proteins and hence on the efficiency of the lime soak.

The improved extraction results from a change in the collagen itself. During the soaking period, collagen loses a small quantity of ammonia and becomes increasingly soluble in hot water. Thus, gradually increased yields of gelatin of strong jelly strength are obtainable as the soak progresses.

Skins, on leaving the lime pit, are thoroughly washed to remove alkalinity and bring them into proper condition for conversion to either gelatin or glue, according to their character. The conversion is carried out in kettles, which may be either wooden tubs, or, for gelatin, stainless steel or aluminium vats, and, for glue, mild steel tanks.

Digestion Process

The skins are left in water held at a temperature of 60°-75°C. and the gelatin solution is then run off, the concentration being a few per cent. The kettle is refilled and the digestion process repeated until the skins have almost entirely disappeared, the temperature being gradually raised during successive extractions. With each succeeding digestion there is a progressive diminution of jelly strength and viscosity.

The dilute solution from the kettles is run through a series of filters to remove any coarse suspended matter, and is then concentrated by evaporation. The viscous liquid thus produced is bleached and the *p*H is adjusted to increase resistance to bacterial attack. The concentrated liquor is run off and allowed to set to a jelly, which is cut into thick cakes and passed through a tunnel drier to remove the remainder of the water. Alternatively, the cakes can be formed by running the solution on to a chilled stainless steel belt.

Since no two batches of glue or gelatin are alike, reproducibility can only be achieved by blending different batches. This can only be done satisfactorily in some finely divided form such as powder, so that glue for most technical purposes and gelatin for both technical and culinary purposes are usually ground. By the time the dried cakes have been ground, test figures are available, which enable a product of fixed characteristics to be produced by blending. After blending, the powder is again tested in the laboratory.

The quality of gelatin is assessed very largely by the jelly strength (the elastic property of the jelly) and/or the viscosity of the gelatin solution, depending on the application for which a particular batch is intended. Another important factor is colour, which tends to deepen as the time and temperature of extraction are increased.

It is important, therefore, that the processes of pre-treatment and conversion should be scientifically studied in order to minimise degradation and produce the maximum amount of high-grade material. Since the normal liming process occupies about three months, any means of shortening or facilitating that process might be of profound economic importance.

Molecular Structure

To facilitate the conversion of the raw materials into products, the Research Association considers it will be necessary to find out a great deal more about the actual structure of the gelatin molecule, in order to determine both the influence of heat and time on the molecule and the influence of modifications in pre-treatment on the products. Because collagen, an important constituent of the raw material, is insoluble in all ordinary solvents, a direct approach to the problem would present considerable difficulties, so that it may be easier to deduce what changes are going on in the raw materials by the changes noted in the end-product.

Study is being given to the properties of the solutions and gels which gelatin makes and to relate this with what can be found out about the structure of the gelatin molecule and its interactions. Identification of the small quantities of materials other than gelatin which may be present in the finished product will be an integral part of this work. Some of these materials are already well known and present no problem, such as the salts obtained from water used in processing, calcium from the liming operation, etc. There may also be small quantities of organic substances present in the raw materials, however, which might in particular circumstances modify the properties of the products.

The most important properties which it is hoped to relate to structure are the elastic properties, the study of which necessarily includes the mechanism of the gel formation. Other subjects for investigation include the viscous behaviour of the solution, the problems of adhesion and swelling, the diffusion of water in the gelatin and also the diffusion of ions. The behaviour of gelatin at an interface—*i.e.*, between an oil and water surface—will also be examined, and this investigation will lead to study of the emulsions in which gelatin is used as an emulsifying agent. Attention will also be devoted to the various ways in which reactive groups of gelatin can combine.

Further scope for research is presented by the elimination of metallic contamination. Edible gelatin has to conform to a specification of 1.4 parts of arsenic per million, a limit which seems unduly low when compared with arsenic contents of 36-110 parts per million in lobster or 40-174 parts in prawns. The explanation is that the limit was drawn up in the first place to cover food products consumed in substantial quantities without dilution, whereas table gelatin is usually diluted to a considerable extent.

A process in which arsenic is separated from a gelatin solution by the use of finely divided alumina is the subject of a very recent patent by George Nelson, Dale & Co., Ltd.

Another aspect of the research programme involves the important question of bacteriological control throughout the process, which is essentially a matter of considering the various stages of manufacture and determining the points at which difficulties are liable to arise. The total count of bacteria may be wholly misleading, however, since many of the bacteria might be unimportant. Bacteria, present in the raw materials, when conditions are right for their growth, may modify the gelatin and also produce waste products.

Having an understanding of some of the problems, it may be possible to apply some of the knowledge gained to the uses of gelatin. This might result in the development of products capable of being used for new applications either as they stand or after suitable modifications.

Impurities

The lowest extractions in gelatin manufacture, or special extractions of certain types of material such as rabbit skins, become hide glue. The only differences between these products and gelatin are that the former are more degraded and normally contain more impurities, since they come mainly from fleshings which have not had long lime treatment, or from materials which may not have been limed.

The traditional way of making hide glue is to boil up the material with water until the solution is strong enough to set, a process which considerably degrades the material. Modern practice is to extract as much gelatin as possible and convert the remainder of the material into glue.

Bone glue is also a product of waste material, which in this instance consists mainly of "home bones" from butchers and slaughter houses, etc. A certain amount of imported bones is also used, but these are much more costly than the local products.

As a rule, the bones, after breaking down and pre-treatment to remove meat residue, are steeped in sulphur dioxide water. The glue is then extracted in autoclaves by pressure steam and extraction with water. Early extractions are usually evaporated as such, but in subsequent ones the liquor from the previous digestion may be used once or several times. Preservatives are often added and the product is then evaporated until it will set on cooling. The subsequent processes of manufacture leading to the finished product have already been described.

Since bone glue is a cheaper product than gelatin and the plant used in its production is much less flexible, the introduction of substantial modifications in manufacturing methods would probably be uneconomic. It is therefore anticipated that research in the bone glue industry will be concentrated more on properties and applications and less on the manufacturing processes. Much of the general work detailed for gelatin will be equally applicable to bone glue.

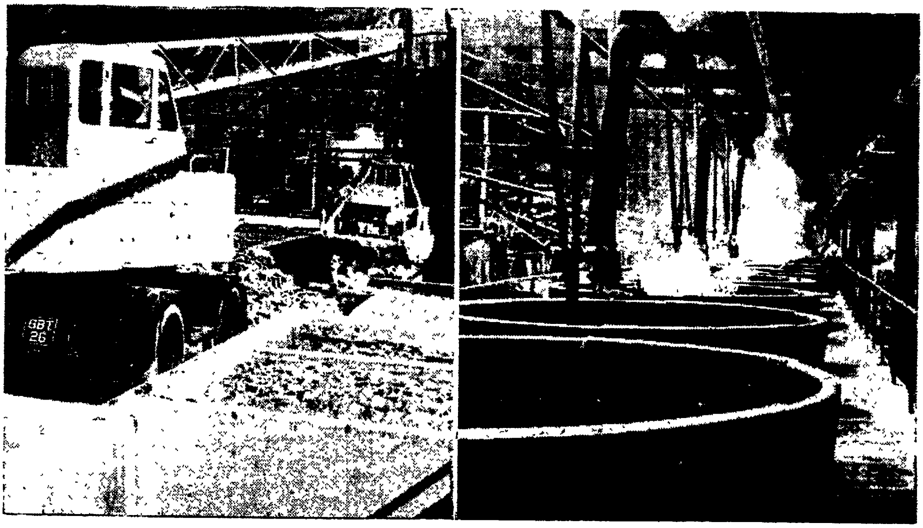
The by-products of this industry are extremely important, since they afford principally high value fertilisers and animal feed, and the fats are used mainly in soap-making. Virtually everything in the raw material which goes into the factory to produce gelatin or glue helps to form a product serving some useful purpose.

Probably the widest field for research is presented by the numerous applications for gelatin and glue, the association's approach to which will be governed largely by the information derived from fundamental studies.

Gelatin is used extensively in photographic emulsions, its desirable properties for this application including elasticity, power of setting, adhesion, ability to allow diffusion, etc. It is capable of being hardened and also stabilises the suspension of silver halide particles. The presence of certain trace compounds also sensitises the emulsions.

Such general properties as swelling, setting, etc., will be studied in connection with the general programme, and data of value to the photographic industry may well result.

The food industry uses gelatin largely for glazing, and as an edible emulsifying agent, apart from the use in table jellies. For these applications the most important properties, generally speaking, are the



[*Courtesy, Richard Hodgson & Sons, Ltd.*

Left: *Mechanical handling of hide pieces in the limeyard.* *Right*: *Extraction of technical gelatin from fleshings* elastic properties and setting point, and to a lesser extent colour. All gelatin use for foodstuffs must, of course, conform to the requirements of the Edible Food Order in regard to freedom from arsenic and heavy metals, and a satisfactory bacterial condition is obviously important.

Both gelatin and glue are used in a wide variety of industries for sizing paper, textiles, wallpaper, carpets, tapestries, and many other articles. The most desirable properties for these applications appear to be adhesion to the substance being sized, strength of the gelatin or glue film, its surface properties, and the viscosity of the solution when applied.

The principal use of glue is as an adhesive for wood, but both glue and gelatin are also used as binders for solid powders, as in match heads and sand and emery papers. Here the problems to be studied include viscous behaviour, rate of setting, and the rate of deterioration on heating.

Research relating to adhesive applications involves the fundamental problem of improving the water-resistance of glue. At present glue is not used as an adhesive for plywood for outside use because of its hygroscopicity. It is obviously desirable that this limitation should be overcome.

The printing industry uses gelatin and glue in photolithography, collotype, etc., an application which depends on the light hardening reaction in the presence of bichromates. This reaction is little understood. Print rollers rely on their elastic properties and resistance to wear, and reduction of swelling at high temperatures would therefore be advantageous.

A high-grade gelatin is used in the manufacture of pharmaceutical capsules. There is, in fact, hardly an industry in which no applications can be found for either gelatin or glue.

The field for research is truly enormous and it is obvious that in its initial approach to the problems the association will have to be selective. Nevertheless, the work requires to be planned comprehensively as a single programme, in order that the various aspects of research can be co-ordinated and correlated. A broad programme of work for the next few years has therefore been mapped out, as well as an immediate programme which is already under way. The fields selected for immediate study include molecular weight and dimensions, viscosity and elasticity, degradation by heat, the formation of colour, and bacterial problems.

Foreign Studies of Colloid Effects

Changing Views of Ageing and Rancidity

COLLOIDS evolve and develop under the influence of factors about which relatively little is known and to which no profound study has been given, despite the great activity of colloid chemists and physicists during the past half century.

This is the view of W. Kopaczewski, a leading authority in colloid research, who gives examples (*Chim. et Ind.*, 1950, 63, 27-33, Jan.) to show that ageing may prove beneficial, as in the case of wines and spirits, of clays in Chinese porcelain manufacture and of photographic plates to improve their sensitivity; or adversely as in the loss of potency of mineral spring water away from its environment, or in the reduced elasticity of rubber. There is as yet no wholly satisfactory explanation of these changes.

The extensive literature of the subject reviewed by Kopaczewski covers many other examples of ageing in most fields of industry, including metal corrosion, soap hydrosols, gelatin, lime and cement, clays, paper, fats, etc.

Particularly interesting cases are those of oils and fats and rubber. In the first the causes of ageing or rancidity have not by any means been fully explained. It has been shown, indeed, that the change occurs only in the presence of light and moisture.

Micro-organisms do not appear to play a leading part here, since, according to Husa, rancidity of sweet almond oil may take place even in the presence of antiseptics such as benzoic and salicylic acids or hydroquinone. It has also been noted more readily in sheet tin containers than in those of other kinds. In any case it is accompanied, chemically, by saponification, and physically by emulsification of the saponification products. Hydrolysis or oxidation alone does not appear as an effective cause.

Uncertainty as to the real mechanism of rancidity explains the numerous purely empirical methods proposed for overcoming it.

Ageing of rubber is a well known phenomenon, due chiefly to oxidation, by which the rubber loses flexibility and becomes hard and brittle. If protected from air and light, vulcanised rubber does not age.

INSECTICIDES IN TREATED FOODSTUFFS

Isotopic Tracer Study of "Take-up"

TO determine minute traces of fumigants and other insecticides present in treated foodstuffs and in insects, work has been started on the use of radioactive materials. A special DSIR laboratory has been equipped and initial experimental work has been carried out with the fumigant methyl bromide labelled with radioactive bromine of half-life 34 hours (Br^{82}).

It was first necessary to work out all the details for its synthesis on the millimole scale under conditions suitable for radioactive material. Yields of about 90 per cent theoretical were eventually obtained, the product having a boiling point within 0.1°C. of the theoretical value, boiling point being taken as the criterion of purity. This method is now in use for the preparation of radioactive methyl bromide from active potassium bromide prepared in the atomic pile at Harwell, states the Report of the Director of Pest Infestation Research, Department of Scientific and Industrial Research, recently published (HMSO, 1s. net).

Preliminary experiments with labelled methyl bromide were made with the object of gaining experience with radioactive material and testing the envisaged applications. This work also necessitated the design of a reproducible experimental technique for the accurate assay of bromine radioactivity. The sensitivity of the methods appeared to be at least as great as that calculated.

Accurate Determination

Using the prepared labelled methyl bromide, weights less than 0.05 microgram could be determined to within a few per cent. This means, for example, that methyl bromide of the order of 0.01 parts per million could be estimated with similar accuracy. Methyl bromide concentrations in air of about 0.1 mg. per litre in 1-c.c. samples could be determined to within two or three per cent. Comparable accuracy by normal electrometric or chemical methods using 1 litre samples would be considered satisfactory.

The electrometric method for determining small methyl bromide residues in tobacco was tested, using labelled fumigant. Chemical and electrometric methods are normally handicapped by the presence of considerable quantities of natural bromide and chloride.

A method was successfully developed for the continuous measurement of the rates of sorption of labelled methyl bromide by various substances. The method will shortly be applied on a useful scale. Sorption data which have practical and fundamental applications will be accumulated far more rapidly and with greater accuracy by using labelled fumigant.

Labelled methyl bromide is being used in the microscopic location of fumigant taken up by insects exposed to the vapour. In this field progress has so far been made only in experimental technique, but the first results, states the DSIR report, are promising.

Distribution in Insects

The radioactivity of labelled methyl bromide fixed by insect tissue is likely to be in the form of water-soluble bromide, so that the methods of fixing dehydration, etc., normally preceding histological examination must be avoided as they would certainly affect the distribution of the insecticide in the insect tissue.

The method of Altmann (1890) developed by Gersh (1932) in the U.S.A. has been modified for the present studies. Insects killed by exposure to labelled methyl bromide are plunged into isopentane at -180°C. The frozen tissue is then transferred to a chamber at -30°C. and the water in the tissue (present as ice) distilled off at a pressure of 10^{-4} mm. mercury. The process of dehydration is followed on the Pirani gauge.

The tissue is next embedded under vacuum and sectioned. The sections are then treated with photographic emulsion, processed, stained and examined microscopically. The emulsion responds to the radiation from the fixed insecticide and the method is termed auto-radiography. It has been successfully applied by other workers to the location of radio-iodine in thyroid and radio-phosphorus in plants, bone, etc.

At some stage in radioactive tracer work it is necessary to measure quantitatively the radioactivity of samples. Electronic equipment designed for this purpose was therefore assembled. Much of this equipment was made available by the Atomic Energy Research Establishment.

The assembled apparatus was tested with standards of known radioactivity. Various characteristics such as "recovery times" had to be determined by means of a cathode-ray oscillograph before proceeding with quantitative work. Certain aspects of the equipment were also studied in order that a limited amount of servicing could be done on the spot.

The possibility of using synthetic insecticides for the control of stored-food pests has been found by the DSIR pest infestation research laboratory to depend very largely on the amount of insecticide that may be taken up by exposed foodstuffs. To this end, work has continued on the measurement of DDT residues in foodstuffs stored in sacks impregnated with insecticide. The amount absorbed was in some cases surprisingly high, and can be shown to be largely dependent on the fat content and the fineness of division of the foodstuff.

Work on DDT smokes has included measurements of the toxicity to insects of the actual smoke and of the films of DDT formed by the deposition of the smoke on building surfaces. It was found that not only were the deposits about 20 times as heavy on the floor as on the walls and ceiling, but, surprisingly, the deposits at floor level contained 66 per cent, by weight, of DDT. Those on the walls and ceiling contained only 12 per cent.

FOREIGN STUDIES OF COLLOID EFFECTS

(*continued from page* 294)

Earlier views on this subject have, however, been considerably modified by the work of Stevens, Moureux et Dufraisse, Evans and the Research Association of British Rubber Manufacturers.

In regard to the important field of pharmaceuticals, including sera, the author in 1934 investigated the physico-chemical changes occurring through ageing while kept under antiseptic conditions. He extended his studies in 1938, arriving at the following tentative conclusions: viscosity of the serum increases, surface tension falls considerably, *p*H has periodic changes, and lacto-gelling is increasingly retarded.

On examining their chemical composition in 1947, especially that of the deposit formed, it was found that the latter consists of 64 per cent protein and 34 per cent calcium salts of fatty acid (lime soaps) having a melting point of 48-49°C.

Similar results have lately been reported by Polonowski (*Comptes Rendus*, 1948, 227, 1420). In view of the presence of these lime soaps Bertrand (*ibid*, p. 1308) has proposed to decalcify these curative sera by adding sodium oxalate (See also the 2nd edition of the author's work, "The Colloidal State and Industry," 1949).

Investigation of the various chemical and physical factors revealed the following effects. To start with, mechanical stirring permits the separation of albumin or rubber from their dispersions; it inactivates ferments; and often a definite shock may cause labilisation, *e.g.*, as by explosion. This is the case with aqueous emulsions of petrol, benzene, etc.

Heating colloids also has a labilising effect, with resulting flocculation, coagulation, or liquefaction.

The effect of radiation is less definite, except that in the short wave range. It has been found when irradiating an aqueous dispersion of gelatin with ultraviolet rays there is a marked change in structure. With blood serum flocculation may occur. According to Rajewski, this has a periodicity corresponding to the time of exposure.

Improved methods of determining radiant energy, due to de Broglie and others, have facilitated observations in this field, as also have many improvements in microscopic technique in recent years. Radium emanations, electric discharge—*e.g.*, during thunderstorms—cosmic rays, magnetic storms, are other physical factors that may be mentioned.

The author refers to the interesting point which has often been emphasised, that the colloidal state represents a transition between the molecular state, governed by the laws of chemistry, and the particulate state mainly subject to the laws of physics; though there are varying intermediate stages.

Particle size and dispersion are naturally of great importance, as shown in the industrial properties of kaolin and photgraphic plates, and stability is largely dependent on these two factors. Other important considerations affecting stability are: the electric charge carried by the colloidal micelles, interfacial tension, and viscosity of the intramicellar liquid.

All this stresses the importance of the growing science of electrocapillary chemistry, which mainly originated in France, and holds the promise of fundamental advance in colloid technology.

Portugal's Chemical Industry

The article on page 279 of our issue dated February 18, "Portugal's Chemical Industry," was mistakenly attributed to our French contemporary *Chimie et Industrie*. It should have been credited to the German journal *Chemische Industrie*.

HELIUM ENGINEERING

Vast Storage in the U.S.A.

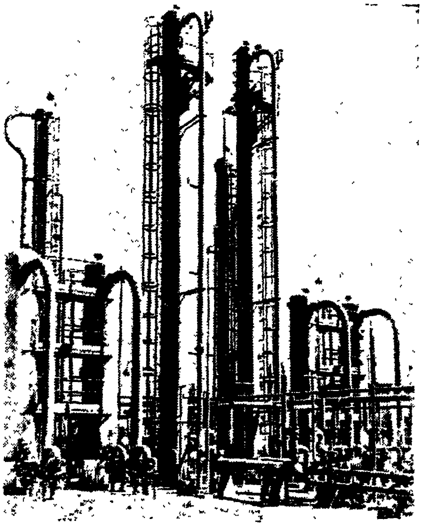
From A CORRESPONDENT

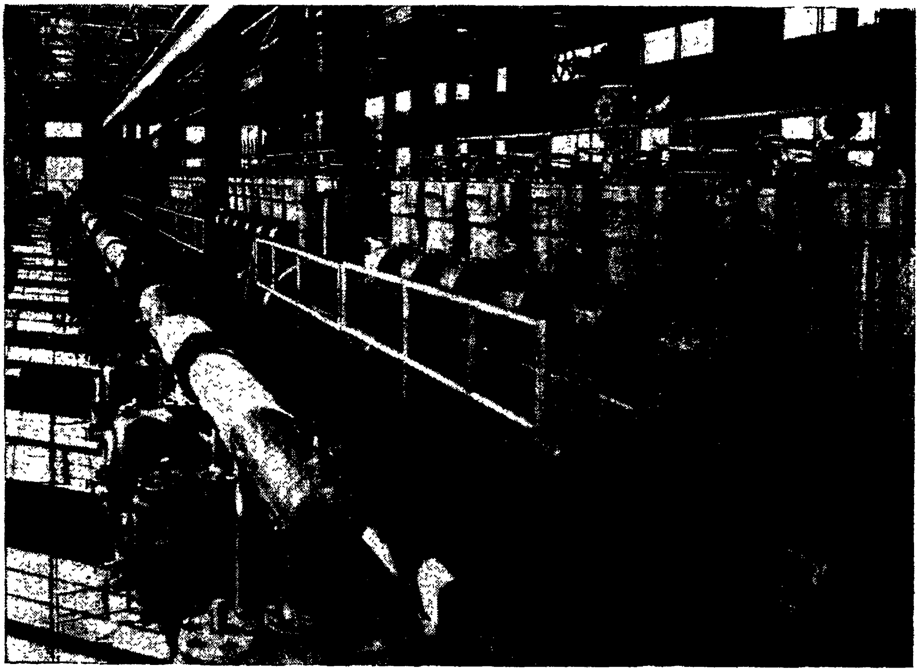
TO conserve surplus helium, a vast storage reservoir is being used in Texas by the U.S. Bureau of Mines. This is made possible by the completion of a 32-mile pipeline between the Exell and Amarillo helium plants and of pipeline connections with the Cliffside natural gas field, where the gas is pumped into one of 11 producing wells. U.S. production of helium in one year totalled more than 68 million cu. ft.

Although the helium must be repurified when it is withdrawn, the gas from the cache is extremely rich in helium content, the processing time is reduced and there are immediate supplies available.

Almost all helium to be returned to the ground comes from the Exell plant, where U.S. Bureau of Mines—the only producer of helium in the U.S.A.—extracts it from

(*continued at foot of next page*)





Compressors at Exell, Texas, one of the plants operated by the U.S. Bureau of Mines to provide helium for industrial and scientific purposes. Above: The carbon dioxide removal unit

Basis of New Fluorinated Materials

Use of Trifluoro Acetic Acid in Thermoplastics

From A SPECIAL CORRESPONDENT

TRIFLUORO acetic acid (CF_3COOH) is one of the important new materials contributing to the synthesis of a number of fluorinated compounds. It can be used in the production of vinyl trifluoro acetate (b.p. 39.5-40.5°C.) by the reaction of acetylene with the acid, using mercuric oxide or sulphate as a catalyst.

Polyvinyl trifluoro acetate is a potentially valuable thermoplastic which may one day be developed on an appreciable commercial scale. The vinyl polymers are described in U.S. patent 2,436,144 and British patent 589,197. Some of the esters made by reacting trifluoro acetic acid with alcohols in the presence of mineral acids may be of interest as solvents.

This is also the starting material for the manufacture of fluorinated azo dyes for cellulose derivatives, silk, wool and nylon. Here the trifluoro acetamide group is used in the preparation of the colours; the amide can be made by reacting ammonia with ethyl trifluoro acetate in anhydrous ether.

An important application of the acid is in the manufacture of fluorocarbons, *e.g.*, by the electrolysis of the sodium salt of trifluoro acetic acid, hexafluoroethane can be prepared. Fluorocarbons now embrace plasticisers, lubricants and polymers such as polytetrafluoroethylene.

Another interesting application of trifluoro acetic acid is as an acid condensing agent, *i.e.*, the condensing of acetic anhydride with anisole to produce *p*-methoxyaceto phenone (Newman, *Amer. Chem. Soc.*, *67*, 345 (1945). It has also been suggested that trifluoro acetic acid might be useful as a nitrating medium.

A large number of the organic compounds made from trifluoro acetic acid have not yet been fully evaluated. Among the interesting chemicals which can be formed are trifluoro acetophenone by reacting trifluoro acetyl chloride with benzene in the presence of aluminium chloride, and α-trifluoro-*p*-phenylacetophenone by reacting trifluoro acetyl chloride with diphenyl in the presence of aluminium chloride.

Basic Characteristics

Trifluoro acetic acid is a highly corrosive, colourless acid possessing a strong, pungent smell. It has a boiling point of 71.1°C. at 734 mm. and freezing point -15.3°C. The acid is completely miscible with water, ether, petroleum ether, acetone, methanol, and a number of other common solvents, but insoluble in mineral oil and carbon disulphide. Trifluoro acetic acid forms a constant boiling mixture with water; the mixture contains 79.4 per cent trifluoro acetic acid and boils at 105.5°C.

The acid is very hydroscopic and glass bottles containing it need to be packed securely. Either glass stoppers or polystyrene caps containing PTFE liner are recommended. Ordinary closures made of cork, rubber, phenolic mouldings and polythene are all attacked by the acid.

The low surface tension, 14.2 dynes/cm. at 30°C. makes it difficult to seal bottles tightly as the acid shows a marked tendency to creep. Metal vessels cannot be used for handling or storing trifluoro acetic acid as practically all non-ferrous and ferrous metals are attacked.

HELIUM ENGINEERING

(*continued from previous page*)

natural gas flowing to industrial and commercial plants. Limited storage facilities have in the past made it necessary to allow large quantities of natural gas still containing helium to be marketed.

The pipeline—the second of its kind constructed by the Bureau—serves two main purposes. It carries the excess helium from the Exell plant to the Cliffside well and transports helium from Exell to the Amarillo plant for leading into tank cars. Moreover, the production capacity of the Amarillo plant is not limited to gas from the original Cliffside field, but is greatly increased by processing the high-purity helium from the underground storage.

To construct the Amarillo-Exell line, pressure welding was employed so that a virtually unbroken 2-in. cylinder was extended for 32 miles. Before being coated and wrapped to minimise corrosion, the line was filled with natural gas and carefully examined for leaks by water test.

To guard against damage and loss of helium in the event of a break a series of valves automatically close the pipeline on each side of the break, thus preventing loss of the helium in the lines.

THE MINOR CONSTITUENTS OF COAL

Wide Range of Organic Materials and Metals

by A. C. MONKHOUSE, B.Sc., Ph.D., F.R.I.C.*

NITROGEN is found in all coals and amounts to 1-2 per cent. It is derived mainly from the proteins or other nitrogen-containing compounds of the original plants, but a portion may come from animal proteins. No definite information is available of the form of these nitrogen compounds.

Solvent extraction is not very successful in removing nitrogen products. High vacuum distillation at a low temperature[1] gave a small quantity of nitrogen bases.

Several workers[2,3] by heating coals at varying temperatures and comparing the behaviour of the nitrogen with that of known nitrogen compounds, have postulated the presence of an amino group, or a substituted amino group in coal, but whether they exist as such in the original coal or are, as is more probable, a secondary product produced by heating the coal, is not known.

Treatment with sulphuric acid[4] has shown that 5 per cent of the original nitrogen of the coal can be extracted; mono-amino acids and amides are present in the extracts. By oxidation by the Kjeldahl method[5] nicotinic acid has been said to be isolated, giving evidence of a heterocyclic-ring system in coal.

Oxidation experiments at the Fuel Research Station[6] using alkaline hypobromite, showed the presence of a small quantity of 1:3:5 tribromo-aniline, indicating association of a part of the nitrogen with a carbocyclic ring. There still remains considerable work to be done before a definite answer can be given as to the constitution of the nitrogen compounds in coal.

Liberation of Ammonia

During coal carbonisation nitrogen is first liberated as ammonia between 315°C. and 400°C.; the evolution continues with rising temperature, reaching a maximum at about 800°C., when the liberation of ammonia ceases.

The percentage of the nitrogen evolved as ammonia is small, amounting to 11-17 per cent; the greatest portion is left in the coke and amounts to 50-80 per cent. The remainder is found in the tar bases, or in the gas as hydrogen cyanide and nitrogen. Under certain conditions during carbonisation hydrogen can increase the proportion of nitrogen evolved as ammonia,[7,8] but its action is limited.

The nitrogen left in the coke is in a very stable form and can be liberated only as ammonia by gasification of the coke. It has been shown[8,9] that the carbon-nitrogen ratio remains constant during gasification, indicating that the nitrogen is combined with the carbon and cannot be liberated. Advantage is taken of this in the Mond system of gasification, in which air, saturated with steam, is passed through the fuel bed. Yields of ammonia are obtained equivalent to 70 per cent of the original nitrogen of the coal.

Ammonium Sulphate

At all coke ovens and many gas works the ammonia is recovered as ammonium sulphate, the ammonia being absorbed in sulphuric acid. The amount recovered by carbonisation in Great Britain amounts to over 800,000 tons per annum.

About 3 per cent of the nitrogen of coal is found in the tar from carbonisation, mainly as bases such as pyridine, and 1-1.5 per cent of the nitrogen cyanide in the gas, or as ammonium cyanide in the ammonia liquor.

The next most important element is sulphur, which occurs not only in the organic material, but also in the inorganic material, or mineral matter of coal.

The inorganic sulphur of coal exists mainly as pyrites and marcasite, with some sulphate, usually calcium sulphate. The organic sulphur may be derived partly from the sulphur compounds of the original vegetation from which the coal is formed, and partly from the action of sulphur bacteria on iron sulphate and organic matter.

Attempts have been made to extract from coal compounds containing sulphur. Traces of mercaptans and di-sulphides have been found, but the main sulphur compounds cannot be extracted. There is some indication that the organic sulphur compounds, and the nitrogen compounds are part of the fundamental composition of coal.[10]

Iron pyrites is the main inorganic sulphur compound. It can occur as layers in the coal bed, as modules and lumps, or as minute particles dispersed throughout the mass of coal. The pyrites may have been formed by the reduction of iron sulphate by organic matter. Another possible mode of formation is by the interaction of hydrogen sulphide, evolved during decay of the vegetable matter, with iron salts.

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* Abstract of a paper presented before the Royal Institute of Chemistry and the Woolwich Polytechnic Scientific Society at Woolwich, November 28.

The total sulphur of British coal ranges from 0.5 to 4.0 per cent. If the sulphur is in the pyritic form it may be possible to reduce the sulphur content of coal by mechanical cleaning, either in dry cleaners or wet washers.

Pyrites

Before 1939 there was a limited recovery of lump coal pyrites, amounting to 4000 to 5000 tons per annum. This was used for the production of sulphuric acid, but it provided only about 1 per cent of the total production—a negligible amount. During the wartime demand for sulphur-containing materials for the manufacture of sulphuric acid, in addition to increasing the amount of lump pyrites recovered, plant was installed at eight collieries[11] for the recovery of coal-pyrites fines. The production of coal pyrites was increased to 10,000 tons of lump per annum, and 25,000 tons of fines, equivalent to 5 per cent of the sulphuric acid industry's total requirements. One advantage of coal pyrites is that it is relatively free from arsenic.

When coal is burnt, the major portion of the sulphur is converted to oxides of sulphur, mainly sulphur dioxide. It is estimated that the total pollution, calculated as sulphur dioxide, amounts to about five million tons a year, of which one-fifth is from domestic appliances.

The removal of oxides of sulphur from chimney gases involves complicated washing equipment and is very costly, and no marketable product is recovered. Plants were installed at two power stations in London—Battersea and Fulham—and for a time at Tir John in South Wales. The cost before the war was two to three shillings per ton of coal burnt, but today's cost has been estimated at nearer ten shillings a ton. A cheaper process is required, one that would be applicable, not only to large boiler installations, but also to smaller ones, and one that would produce a marketable product, preferably sulphur.

Besides the damage caused by the oxides of sulphur emitted when coal is burnt, sulphur in the coal is also responsible for the formation of deposits on the tubes of generators and superheaters.

The bonded deposits consist of a matrix of sulphates or acid sulphates of sodium and potassium, in which are embedded particles of ash carried forward from the boiler fire. The inner layer of such deposits may contain 50 to 70 per cent of acid sulphates, while the outer layer deposited under hotter conditions contains 20 to 40 per cent of sulphates. Deposits on economiser tubes may contain up to 50 per cent of sulphates.

In the cooler parts of the boiler, such as the air pre-heater, acid deposits may occur which contain 50 per cent sulphur trioxide as sulphates and sulphuric acid. Conditions may be so bad that tubes or plates last only a few months before a replacement is required.

On carbonisation of coal, the sulphur is distributed between the products—coke, tar, ammonia liquor and gas. A typical distribution is :—

In coke	60 per cent
„ tar	1 „
„ ammonia liquor as sulphide	10 „
„ gas as H_2S	27 „
„ gas as CS_2	2 „

The removal of hydrogen sulphide from town's gas (a statutory requirement) is by passing the gas through boxes containing iron oxide by which the hydrogen sulphide is absorbed, forming iron sulphide. This, by oxidation or "revivification," is converted to sulphur and iron oxide which can be used again until the sulphur content is increased to about 50 per cent. It is then in a form suitable for the manufacture of sulphuric acid. Some 200,000 tons of spent oxide are burnt annually to yield some 250,000 tons of sulphuric acid, in terms of 100 per cent acid.

Other sulphur compounds in carbonisation gases[12] are carbon bisulphide, carbon oxysulphide, and thiophenes, of which carbon bisulphide and carbon oxysulphide are secondary products.

Phosphorus

There are a number of elements in coal whose proportion is very variable, and yet they may have a profound influence on the use to which the coal is put. One instance is phosphorus, of which the amount present in coal is from 0.001 to 0.1 per cent. The source of the phosphorus[13] is thought to be largely the associated minerals in the form of phosphates, often in conjunction with fluorine, e.g., calcium fluorapatite $3\,Ca_3(PO_4)_2.CaF_2$.

When coal is burnt in boilers, phosphorus compounds can be volatilised, and selective condensation in the boiler system can yield deposits containing 20 per cent of phosphorus from coals containing only 0.05 per cent of phosphorus.

Work at the Fuel Research Station has shown that reducing conditions and temperatures higher than 1600° C. are necessary for the volatilisation of " combined " phosphorus, so that where coals rich in phosphorus are burned in certain types of stoking plant in boilers, these phosphate deposits may be found, particularly on generator superheater and economiser tubes.

Where coals rich in phosphorus are burnt in the pulverised form, only loose dusts are formed. The combustion in these circumstances approaches more nearly fully oxidising conditions. A phosphatic deposit, although not as common as a sulphatic one, is much more difficult to remove. The loss of time caused in cleaning boilers at electricity generating stations may amount for one boiler to several months each year.

The phosphorus, when coal is carbonised, is retained in the coke, and if the coke is used for metallurgical purposes, the phosphorus finds itself subsequently in the iron and steel, with detrimental effects. The phosphorus content of coke for certain metallurgical purposes is limited to under 0.02 per cent.

Chlorine is present in British coals from 0.01 to 1 per cent, the usual form being alkali chlorides, mainly sodium chloride.

The chlorine in coal cannot wholly be extracted by water. Cobb[14] showed that 100 gm. of coal, from which 0.38 gm. of chloride could be extracted as chloride in four hours by hot water, yielded a further 0.41 gm. on extraction with 10 per cent nitric acid.

In high-pressure boilers where the temperature of combustion is high, the alkali chlorides are volatilised and react with sulphur dioxide and sulphur trioxide to form bonded deposits on the boiler tubes.

In certain cases there is evidence of corrosion by hydrochloric acid, particularly when burning cokes rich in chlorine. This was noticeable in the coolers and filtering medium of small mobile producers, used during the war as substitutes on petrol-driven engines.

Arsenic Ash

Chlorine in coal can influence the volatility of the other elements present. One example is arsenic. A coal containing 60 parts of arsenic as As_2O_3 per million, 0.02 per cent of chlorine, and an unusually high proportion of carbonate when burnt, retained practically all the arsenic in the ash. When chloride was added to increase the chlorine content to 1 per cent the arsenic in the ash was reduced by over a half.

Another element whose effect has only recently been observed is fluorine. Lessing[15] observed in 1934 the breakdown of porcelain ring packing in a concentrated ammonia liquor scrubber at the Bristol gas works. This was attributed to fluorine compounds in the liquor being distilled.

Crossley[16], about the same time, showed that the etching of glassware in an annealing kiln was due to fluorine compounds from the combustion of the coal used. In both cases the coals were found to contain 85 to 140 parts per million of fluorine.

A survey of British coals showed that the fluorine content varied from five to 200 parts per million, fluorine being in the form of fluorapatite, so that the phosphorus content of coal gives a measure of the fluorine content.

High Fluorine Coals

Coals used for the drying of malt by direct contact with the gases are chosen with low arsenic content to avoid contamination of the malt. Similarly, the danger of contamination with fluorine is possible with high fluorine coals. Crossley examined six light ales, six brown ales, and 12 stouts, and found the average fluorine content 0.6 parts per million, of which 0.5 parts are contributed by the coal, and 0.1 parts by water. These analyses were from an area using low fluorine coals.

More than 30 elements have been found to be associated with the organic matter of coal.

Among the rare elements which have aroused interest in recent years is germanium. The detection of this in any quantity in coal ash was first reported by the late Dr. Goldschmidt.[17] He was examining spectrographically a number of German coals for trace elements, and as a comparison obtained from his local museum collection at Göttingen a 70-year-old sample of English coal labelled " Hartley, near Newcastle." The ash from this sample contained the phenomenally high figure of 1.1 per cent of germanium. It proved to be the richest specimen in germanium which has ever been examined.

One other picked sample from the Yard seam of the Hartley Main Collieries showed 1 per cent of germanium in the ash, but an examination of over 100 samples from the same and adjacent seams showed no figures higher than 0.5 per cent in the coal ash.

A number of tests on boiler deposits show the presence of germanium, and figures of 0.2 to 0.9 per cent of germanium have been reported. Consideration has been given to the possible recovery of germanium from selected dusts.

Germanium is volatilised from coal

during combustion, particularly in a reducing atmosphere, and its volatility is increased if chlorides are present. It is this volatility which is responsible for finding the germanium in the flue dust, rather than in the residual ash of the coal.

In an address at a recent meeting of the General Electric Company, the chairman, Sir Harry Railing, referred to the search made in 1945 for supplies of germanium for use in modern crystal diodes and triodes. A source was found in the flue dusts from Northumberland and Durham coals, and processes for the extraction of the germanium in a high state of purity have been developed.

Gallium

Another element which behaves in a similar manner to germanium is gallium. Again, this is found in larger quantities in the Northumberland and Durham coal fields. Flue dusts have been found derived from coal in these fields with from 0.04 to 0.55 per cent of gallium. One exceptional sample contained 1.58 per cent.

The association of the principal elements with the coal substances and their proportions in British coals are as follows:—

	Per cent in coal	Main source
Nitrogen	1–2	Coal substance
Sulphur	0.5–4.0	Coal substance and mineral matter
Phosphorus	0.001–0.1	Mineral matter*
Chlorine	0.01–1.0	Dispersed throughout coal substance
Fluorine	0.005–0.05	Mineral matter*
Arsenic	0.0001–0.006	Mineral matter*
Boron	0.0005–0.01	Mineral matter and coal substance
Germanium	0.0002–0.008	Coal substance
Gallium	0.0003–0.001	Coal substance
Vanadium	0.001–0.003	Coal substance
Lead	0.001–0.003	Mineral matter*
Copper	0.0005–0.005	Mineral matter*
Zinc	0.0005–0.7	Mineral matter*

* The Advantitious mineral matter.

REFERENCES

[1] Pictet and Bouvier, *Ber.*, 1915, 48, 926-933.
[2] Terres, *J.S.C.I.*, 1917, *36*, 586.
[3] Monkhouse and Cobb, *Tr. Inst. Gas Eng.*, 1920/21, 543-572; 1921/2, 137-158.
[4] Shacklock and Drakeley, *J.S.C.I.*, 1927, *46*, 478-481.
[5] Beet, *Fuel*, 1940, *29*, 108.
[6] *Ann. Rep., Fuel Research Board*, 1937. p. 31.
[7] Tervet, *J.S.C.I.*, 1883, 2, 445.
[8] Salmang, Z. *angew. Chem.*, 1919, *32*, 148.
[9] Pexton and Cobb, *Tr. Inst. Gas Eng.*, 1922/3, 376-415.
[10] Horton and Randall, *Fuel*, 1947, 26, 127-132.
[11] Davies, *Inst. Fuel*, 1948, *31*, 301-311.
[12] Plant and Newling, *Inst. Gas Eng.*, 1948, Comm. 344.
[13] Crossley, *Inst. Chem. Eng.*, 1948.
[14] Cobb, *Gas W.* (*Coking Section*), April 1, 1916.
[15] Lessing, *Nature*, 1934, *134*, p. 699.
[16] Crossley, J.S.C.I., 1944, *63*, 280-292, 342-347.
[17] Goldschmidt, *Nach. Ges. Wiss. Gottingen*, 1930, 398-40; 1933, p. 371-86. *Ind. and Eng. Chem.*, 1935, *27*, 1100-1102.

LEAD TETRA-ACETATE

A New Industrial Oxidising Agent

LEAD tetra-acetate, Pb $(C_2H_3O_2)_4$, is a comparatively new industrial chemical which is becoming of increasing importance, more especially in the U.S.A., as a highly selective oxidising agent in the synthesis of various organic compounds. It is notably important for splitting 1, 2-glycols into two molecules of aldehyde, the reaction being usually carried out in a solvent, such as glacial acetic acid, benzene dichlorethane and nitrobenzene, the velocity being lower in glacial acetic acid than in other solvents. To increase the velocity, water or methyl alcohol can be added.

In a similar way, alpha-hydroxy acids can also be oxidised and split by lead-tetra-acetate. Amino compounds like alpha-amino acids, 1, 2-amino alcohols and 1, 2-diamines, can be split by the lead salt to form an imine which may be further dehydrogenated to the nitrile. In addition, lead tetra-acetate is of great value in the methylation of aromatics and in acetoxylation. The latter can be used for the conversion of various allenes to cyclopropanone derivatives.

Commercial lead tetra-acetate usually contains 85-95 per cent active ingredient as tested by the idiometric titration of Dimroth and Schweitzer, *Ber*, *56*, 1875 (1923). In appearance this crystalline lead salt is colourless to faintly pink in colour and the crystals are always wet with glacial acetic acid.

Corrosion Problems

Like other lead salts, the tetra-acetate is poisonous. Moreover, as it is a strong oxidising agent and is wet with acid, handling and storage present serious corrosion problems. Materials recommended as safe for contact with lead tetra-acetate are stainless steels, glass, porcelain and certain plastics.

This lead compound is unstable and has a very limited life even when stored under the best conditions, *i.e.*, in a cool place with absence of light and moisture. When decomposition does take place it is possible to effect rejuvenation and some lightening of colour by stirring the lead tetra-acetate with half its weight of a mixture of eight parts glacial acetic acid plus one part acetic anhydride and then filtering off the solid tetra-acetate.

S. AFRICA'S NEW PRODUCTION PROGRAMME

Fuller Supplies of Native Materials and Products

From Our CAPE TOWN CORRESPONDENT

CONSIDERABLE impetus to South Africa's chrome industry is expected to result from research on chrome now being carried out by the Council for Industrial and Scientific Research. Officials say that the findings will be released to local industry as soon as possible, but the work is at present in its initial stages. It has been estimated by geologists that the Union has enough chrome to supply the world for the next 200 years. The Transvaal has rich deposits and some of the ore there is reported to be of a higher grade than that found anywhere else in the world. About 80 per cent of South Africa's chrome exports now go to the U.S.A., but development of the Union's own chrome ore industry will mean that the export figure must drop.

* * *

Ocean Products, Ltd., has decided to close its vitamin-oil factory at Gansbaai owing to the continued decline in the world price of this product, attributed partly to Japanese competition. One of this company's other interests, West Coast Fishing Industries, Ltd., is producing fishmeal and oil at the Walvis Bay factory, the demand for which is considerable in the Union and overseas and the prices obtained in the export markets higher than the controlled prices in the Union. As soon as the local demand has been met it is expected that export permits for fishmeal will be issued. The Fisheries Development Corporation, in its fifth annual report, referred to the setback suffered in the vitamin-oil industry in 1949. Now the picture is brighter, and a marked revival is expected, which should help to restore former price levels.

* * *

C. F. and H. Rolfes Bros. (Pty.), Ltd., Elandsfontein Rail, Germiston, Transvaal, is now producing zinc yellows in two types. Both items are stated to have a low percentage of soluble non-chromate salts and to be excellent in combating rust. They are being made in accordance with U.S. Federal specification TT-Z-415 and U.S. Maritime Commission specification 52-MC-29, dated September 21, 1943. This firm expects in the near future to begin production of zinc greens.

* * *

Laboratory glassware for individual requirements is now being made in Durban by a firm of wholesale manufacturing chemists, which recently established a special branch and engaged skilled glass blowers.

* * *

Import control has made it almost impossible for the University of Cape Town to obtain the chemical equipment needed for studies in the current year. No response has been received to applications for import permits for items such as chemicals, glassware and smaller apparatus, totalling £5830. Other universities in the Union appear to be labouring under similar difficulties.

* * *

G. and W. Base and Industrial Minerals, Johannesburg, now has its own mica mine in the Northern Transvaal, and is obtaining from it ruby sheet mica, which is sold under international mica grading.

* * *

A paint factory for the manufacture of high - quality nitro - cellulose alkydised motor-vehicle lacquers, also synthetic enamels suitable for spraying and brushing, was recently put into operation by a new firm in Cape Town. This concern is associated with several prominent Netherlands firms in the same field. Primer surfaces, glazing putty, thinners and other lines used in conjunction with its motor-body lacquers are also being produced. In addition, the firm manufactures a clear gloss alkydised furniture lacquer and a multi-purpose water paint.

* * *

Regi (Pty.), Ltd., Port Elizabeth, has placed on the local market a new plastic material which is stated to be composed to the extent of 90 per cent of local raw materials. It is claimed that articles can be made in comparatively inexpensive moulds and in any colour, with different surface tensions, both rigid and flexible.

* * *

After nearly a year's negotiation with the Union Government, little progress has been made towards the establishment of an oil refinery at Durban. The managing director of Union Petroleum Refinery (Pty.), Ltd., is returning to Britain to consult his principals.

• OVERSEAS •

New Lead Deposits in Brazil

Deposits of lead-ore, reported to be the second largest in Brazil, have been discovered recently in Matozinhos Province, Minas Geraes.

Chile's Twenty-Nine Oil Wells

The first part of a Government plan for the production of petroleum in Chile has been completed. At a cost of 550 million pesos, 29 wells have been sunk at Cerro Manantiales, and eight in other parts of Magallanes Territory.

New Dutch Nitric Acid Principles

A new unit for the manufacture of nitric acid—the third—came into operation recently in the Dutch State coalmines in Limbourg. Almost the entire plant and equipment were made in Holland. Manufacture takes place according to a novel method, developed in the Central Research Institute in Lutterade.

New Chilean Zinc Plant

The Chilean Development Corporation has announced that work will commence shortly on the construction of a zinc refining plant near the existing steel works at Huachipato. Supplies of zinc concentrates will be obtained from mines at San Felipe. The industry is expected eventually to provide employment for about 500 workers.

Demand for German Barytes

Reports from Germany state that foreign demand for German-mined barytes has increased considerably in recent months. The enterprise which exploits the largest occurrences of apatite in Bad Lauterberg in the Harz Mountains is reported to be exporting about 60 per cent of its monthly output of some 200 metric tons, having found new markets in Latin America, especially in Uruguay.

Mining in Belgian Congo

The mining installation for the development of what is believed to be the most important uranium seam in the world is being constructed at Shinkolobine, in the Belgian Congo. Production is expected to be commenced towards the end of this year. An electrolytic plant for the production of zinc is also being constructed in the Belgian Congo by the Union Minière du Haut-Katanga near its existing zinc mine. This is expected to be completed some time in 1951 and to have a capacity of 100,000 tons of zinc annually. Power is to be supplied by hydraulic plant.

Swiss Paint Research

The Association des Chimistes de Vernis has created a study group on paint drying and the production of varnish by infrared rays. Research has started.

Coffee for Plastics

An American company is reported to have asked the Brazilian Government for excess coffee for use in plastics production by a process developed by the Polin Laboratories, New York.

Ruhr Lead and Zinc Deposits

Following recent investigations, it is reported that the Ruhr area contains the largest lead and zinc deposits in Europe. Occurrences of ore have already been ascertained in about 100 coal mines. Exploitation, however, is at present taking place in two mines only, because geological conditions do not permit a simultaneous mining of coal and ore.

Chrome Recovery

The possibility of reclaiming chromium waste from tanneries in New South Wales, Australia, is receiving attention from the State Government which estimates that in Sydney, the State capital, about 12,000 gallons of effluent a week are wasted. Practically all the discarded chrome could be recovered by simple methods, principally precipitation with lime, filtration and heating.

Fall in Swiss Shipments

Official Swiss export statistics for January 1950, show that the value of shipments by the chemical and pharmaceutical industries fell to Fr. 85.6 million from 54 million in December, 1949. Especially marked was the fall in exports of aniline dyes and indigo from Fr. 25.8 to 13.3 million in January, 1950. Exports of pharmaceuticals fell from Fr. 19.8 to 15.8 million and that of industrial chemicals to Fr. 5 million (Fr. 6.8 million).

Chilean Nitrate

An extraction process for the production of soda nitrate which has been perfected by an American engineer, Sherman Lesesne, will, it is expected, enable Chilean nitrate to compete with the synthetic product. A factory of the Antofagasta Nitrate Co. is operating the process at Tarapaca. It is called the butterfly process on account of the pipes being assembled on a tank lorry in approximately the form of wings. The product is not a pure sodium nitrate but a concentrated saline mixture which has to be refined before use as a fertiliser.

The Chemist's Bookshelf

THE COMING AGE OF WOOD. Egon Glesinger. Secker and Warburg, Ltd. 1950. Pp. xv, 279. 18 col. ill. 12s. 6d.

This is a book aimed at the general reader and consequently well charged with overtones and undertones. It is sometimes technically optimistic, forgetting the detailed failures and problems of to-day on the assumption that all will be put right tomorrow. But it is fundamentally sound, immensely readable, and stimulating.

Egon Glesinger, a Czech, has been associated with wood economics and wood politics since 1933, first with the European organisation, CIB, and then from 1946 with FAO's forestry department. This, however, is a personal statement of faith not an official document. Before the war Nazi Germany's technicians saw that wood had a widening future; during it, Sweden built up wood-based industries and so made her isolation more tolerable. Almost simultaneously a tough battle was fought between the alcohol industry and the potential wood-sugar alcohol industry in the U.S.A., a battle in which eventually a certain Senator Truman intervened. Glesinger tells the stories of these ventures as vividly as a New York columnist.

The second half of his book is more technical, but it does not entirely shed the bias of enthusiasm which characterises the first more general half. There are a number of technical and economic difficulties in using wood or such wood wastes as saw-dust as chemical starting-points, to which Glesinger attaches too little weight. However, he shows that all present economic costings of wood and wood products are ludicrously unreal because the various wood-consuming industries have failed to integrate themselves; the wastage of the timber industry would produce all the cellulose pulp the world requires.

Added to this wastage there is the vast fruitless production of lignin in pulp manufacture. But Glesinger is so confident that a new chemical industry will eventually be based upon lignin liquors, comparable to the gas industry's development of tar or to the new petroleum-based chemicals industry, that he fails to make the most of this vital point. The development of lignin is the key and he might justifiably have demanded more scientific attention to lignin, more research and more pilot-work. The certainty of establishing a lignin-based chemical industry would justify all ends to conservation.

Another point insufficiently discussed is the possibility that cellulose supplies can be economically based upon annual vegetable-type crops. Regarding this natural rival, Glesinger could have pointed out that trees thrive upon poorer soils than most agricultural crops, and that trees on high ground are essential for any sound water and soil conservation policy.

Despite these criticisms, this is a stimulating book for laymen and scientists. Coal and mineral reserves can be exhausted. Wood is the one carbon-hydrogen raw material which can be used prodigiously and replenished by re-planting. Egon Glesinger's age of wood is no empty vision.

ACID HANDLING. Imperial Smelting Corporation, Ltd., Avonmouth, Bristol. Pp. 68. 10s. 6d.

Modern methods of handling and transporting sulphuric and hydrofluoric acids comprise the main text of the book, which deals concisely with each phase of the subject. Materials of construction for containing the acids (cast iron and mild steel, special alloys and various non-ferrous metals) are discussed, and their composition, resistance to corrosion and suitability for specific purposes explained. In a chapter on pumps, the characteristics of several important types are set out, the operating efficiency of centrifugal pumps detailed by means of formulæ and diagrams, and considerations suggested in selecting a pump of suitable capacity. Another chapter gives instructions, in chronological sequence, for the safe transportation of sulphuric acid and requirements in the preparation of carboys and drums. Elaborate precautions against accident prevention are described and the protective clothing for workers, as well as other safeguards, are illustrated. Finally, anhydrous hydrofluoric acid is shown to engender no unusual danger when adequate precautions are taken.

· PERSONAL ·

PRINCESS ELIZABETH, DUCHESS OF EDINBURGH, was last week admitted a member of the Royal Institution of Great Britain and afterwards attended a lecture delivered by PROF. E. N. DA C. ANDRADE on "The Nature of Light."

MR. JOHN HITCHCOCK, who since 1946 has been personal assistant to the managing director, Mr. I. A. Bailey, has now been appointed to the newly created post of assistant managing director of Henry Wiggin & Co., Ltd., of Birmingham, manufacturers of nickel and high nickel alloys. Mr. Hitchcock was formerly a member of the Mond Nickel Company's development and research department staff.

SENOR JOSI MARIA ALBAREDA HERRERA, secretary-general of the Spanish Higher Council for Scientific Research, is at present on a three-week tour of Britain. Last week the Spanish soil scientist paid a return visit to the agriculture and physics departments of Leeds University which he last inspected in 1934 when he was working under Sir John Russell at Rothamsted Experimental Station.

MR. HUGH GLASS, of the process control division in the motor cover department at Fort Dunlop, has taken up his appointment as technical manager in Dunlop's Japanese factory at Kobe. MR. J. S. BIRCH has accompanied him as assistant production manager.

Birlec, Ltd., the Birmingham manufacturer of industrial furnaces, has appointed MR. G. P. TINKER as managing director, in succession to the late Mr. A. G. Lobley. Mr. Tinker, a director since 1946, has been a member of the executive staff of the company since its formation in 1927.

The Institution of Chemical Engineers has awarded the William McNab medal, for the best set of answers in the associate membership examination for 1949, to MR. MICHAEL SHAW, of Liverpool. The official presentation is to take place at the institution's 28th annual corporate meeting on April 14 at the May Fair Hotel, London. Mr. Shaw is with the research department of ICI general chemicals division, Widnes.

MR. P. T. HOULDCROFT, of the British Welding Research Association, left on February 15 for the U.S.A., where he will study for a period of from 3-6 months at Rensselaer Polytechnic Institute, Troy, New York, and for a further period, making a total of one year, in various industrial concerns. He will be concerned with the welding of light alloys, in particular fusion welding. Mr. Houldcroft is one of 50 research workers and technicians who have been chosen for similar scholarships provided by the ECA.

The British Council arranged for DR. W. A. ROACH, head of the biochemistry department of the East Malling Agricultural Research Station, Kent, to lecture at an agriculural congress held at the Royal Veterinary and Agricultural College in Copenhagen from February 22 to 25. He was to speak on "Deficiency Diseases in Plants" to horticultural and agricultural advisors from Scandinavian countries.

Obituary

THE death is announced at the age of 89, of PROFESSOR WILLIAM PALMER WYNNE, who was until 1931 Emeritus Professor of Chemistry at Sheffield University. Among his many appointments, he was elected, in 1913, president of the Chemistry Section B of the British Association. He served for two years each as hon. secretary and vice-president of the Chemical Society, of which he was president from 1923 to 1925 inclusive. He contributed many papers to learned journals.

The death has occurred in Glasgow of MR. ROBERT TATLOCK THOMSON, F.C.S., F.R.S.E., F.R.I.C., a Scottish analytical chemist of distinction, who, at 94, had clear recollections of his early association with Sir William Ramsay during early years of service with the family business. He founded R. R. Tatlock & Thomson, Glasgow and Clydebank.

The death has occurred, at the age of 85, of MR. FREDERICK WILLIAM CLARK, who was for ten years, from 1915, chairman of the Salt Manufacturers' Association. He was successively sales manager and managing director of the Salt Union, Ltd., which post he held until 1937, when the firm became associated with I.C.I., Ltd.

The death has occurred at Nunthorpe, Yorks., of MR. STANLEY SADLER, chairman of Sadler & Co., Ltd., chemical manufacturers, Middlesbrough. He was 73. Mr. Sadler had been a member of Middlesbrough Corporation, the Tees Conservancy Commission, Tees Valley Water Board, and the Tees Port Health Authority.

◆ HOME ◆

Laporte Chemicals' Extensions

Extensions to the central laboratories of Laporte Chemicals, Ltd., Luton, which have now been started, will include an experimental plant laboratory and add an area of 18,000 sq. ft. to the laboratories.

Aluminium Drawbridge

Aberdeen Harbour is to have an aluminium opening bridge of the bascule type built at Victoria Dock. The work, expected to cost £88,000, is being carried out by Head Wrightson Aldean, Ltd., a subsidiary of Head Wrightson & Co., Ltd., Thornaby-on-Tees, which constructed a similar bridge, the first of its kind, at Sunderland in 1948.

Mineral Gas Explosion

An explosion at the works of Sandoz Products, Ltd., Canal Road, Bradford, on February 13 was attributed to the collection of mineral gas at the mouth of a 700 ft. water borehole. The gas was believed to have been ignited by a spark from the electric motor of a pump which draws water from a 360 ft. pipe in the borehole.

Talks about Export

The Institute of Export announces an important new series of twenty Lunch Time Lectures on various aspects of export trade, to be held weekly at Conway Hall, Red Lion Square, London, W.C.2, between March 7 and August 1, 1950. Authorities will deal with such subjects as selling overseas, shipping, financing export and exchange and trade control.

Finance for North-East Expansion

Tees-side, the traditional iron and steel producing area, is to benefit by the investment of more than £100 million in its various industries, states the Chamber of Commerce and Industrial Development Board for that area. New and expanding industries are expected to provide additional employment for 35,506 men and women.

Coal Production Improves

Despite the continued decline in manpower, output of coal in Great Britain last week showed a further small rise, the total of 4,358,800 tons comparing with 4,343,100 tons in the previous week and 4,295,400 tons in the corresponding week of 1949. In the first seven weeks of this year 29,989,500 tons were raised, an increase of 566,400 tons on the same period last year.

Twenty-six Women Pharmacists

Thirteen women have become qualified pharmacists at this month's examinations of the Pharmaceutical Society in Scotland. The same number qualified at the corresponding examinations in England. Thirty-four men were successful.

New Factory for Seaweed Products

A factory for the manufacture of dried pulverised fertilisers, animal feed, etc., is to be set up near Nairn, Scotland, by Seaweed Products, Ltd. At the company's temporary premises at Ardersier, in the same district, only cattle and pig food is at present being produced.

Penicillin Price Reduction

The sixth reduction in the price of penicillin, since supplies were made freely available in 1946, has been announced by Glaxo Laboratories, Ltd. This brings the price of crystalline penicillin to the same level as that of the amorphous (yellow) variety.

Damage at I.C.I. Plant

An outbreak of fire in an oleum plant in a shed at the Dalton works of I.C.I., Ltd., Huddersfield, this week, was extinguished in about half an hour by the local and works fire brigades after damage had been done to the plant and the roof of the building.

N.C.B. University Scholarships

For the third successive year the National Coal Board is offering scholarships for degree courses, mainly in mining subjects, for which applications are already being received. Of the 100 scholarships offered, five are under a scheme for Fuel Technology Scholarships offered by the British Coking Industry Association. The awards are worth up to £300 a year, and there is an additional allowance for married men.

Consultation for Coke Oven Workers

A joint consultative council for all employees in that part of the coke oven and by-products industry which has vested in the National Coal Board was set up in London on February 15. It will operate on lines similar to that existing in the mining industry and will affect about 7000 coke oven and by-product workers at 52 plants. The Coke Oven National Consultative Council is composed of representatives of the board, the Coke Oven Managers' Association, and the National Union of Mineworkers.

Next Week's Events

MONDAY, FEBRUARY 27

The Chemical Society

Oxford: Physical Chemistry Laboratory, 8.15 p.m. Sir John Lennard-Jones: "Some Unifying Concepts in Chemistry."

Institution of Works Managers

Glasgow: 39 Elmbank Crescent, C.2, 7 p.m. Dr. S. I. A. Laidlaw: "Occupational Health as a Part of the Provisions of a Public Health Department."

TUESDAY, FEBRUARY 28

The Society of Instrument Technology

London: Manson House, Portland Place, W.1, 7 p.m. Dr. H. Spencer Gregory and E. Rourke: "Some Modern Aspects of Hygrometry."

WEDNESDAY, MARCH 1

The Chemical Society

Eire, Dublin: University College, 7.45 p.m. (with ICA, RIC and SCI). Prof. M. Stacey: "Deoxy-sugars and Nucleic Acids." (Also at University College, Cork, 7.45 p.m., Friday, March 3.)

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Dr. J. W. Cuthbertson: "Continuous Casting of Metals."

THURSDAY, MARCH 2

The Chemical Society

London: Imperial College of Science and Technology, S.W.7, 7.15 p.m. Prof. Dr. Pl. A. Plattner: "The Azulenes."

Hull: University College, 6 p.m. (with RIC). Dr. G. M. Bennett: "Aromatic Nitration."

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. E. C. Childs: "The Permeability of Porous Materials." C. Kemball: "The Adsorption of Vapours on Mercury"—IV. (Surface Potentials and Chemisorption).

The Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. Discussion: "Some Modern Aspects of Welding."

FRIDAY, MARCH 3

The Chemical Society

Manchester: University, 6.30 p.m. Prof. Dr. Pl. A. Plattner: "The Azulenes."

Southampton: University College, 5 p.m. Dr. H. Irving: "The Determination of Traces of Elements and Compounds."

Swansea: University College, 5.30 p.m. Prof. F. E. King: "Synthetic Investigations in the Series of Cyclic Imines."

The Royal Institute of Chemistry

London: Woolwich Polytechnic, S.E.18, 7.30 p.m. Dr. N. Booth: "Careers for Chemists."

SATURDAY, MARCH 4

The British Interplanetary Society

London: Caxton Hall, S.W.1, 6 p.m. H. F. Zumpe: "Testing of Rocket Motors."

The Association of Scientific Workers

London: St. Pancras Town Hall, Euston Road, N.W.1, 2.30 p.m. Conference: "The World's Food and Britain's Needs."

Electrodepositors' Jubilee

PLANS for the special conference and celebrations to mark the silver jubilee of the Electrodepositors' Technical Society have now been announced in a brochure presenting the programme to be followed at the Grand Hotel, Eastbourne, Wednesday, April 19, to Saturday, April 22.

During five technical sessions there will be presented a wide range of papers and discussions. Mr. A. W. Wallbank, president, will be chairman at the opening session on Thursday, which will be devoted to electropolishing. The second session (2 to 4.30 p.m. the same day) will be concerned with alloy deposition.

Miscellaneous papers will occupy the third session on Friday morning, when the chair will be taken by Mr. R. C. Davies, chairman, Midlands centre. The fourth session in the afternoon will be under the chairmanship of F. Mason, chairman, Sheffield and North-East centre, and will be divided into two parts, one on metal cleaning and the other a discussion on education in the electroplating industry.

The technical programme finishes on Saturday morning with a discussion on the interpretation of specifications.

Chemical Engineers Meet

THE 28th annual corporate meeting of the Institution of Chemical Engineers will be held at the May Fair Hotel, London, on Friday, April 14. During the morning business session presentations of medals will be made.

"Technology and the State" will be the subject of the presidential address to be given by Professor D. M. Newett at 12 noon. The annual dinner will be at 7 p.m.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

Copper & Alloys, Ltd., West Bromwich. (M., 25/2/50.) January 23, £165,000 charge (further increasing limit secured by a charge dated July 19, 1940, etc., from £360,000 to £525,000), to N. M. Rothschild & Sons, London; general charge. *£370,000. July 25, 1949.

Petrochemicals, Ltd., London, W. (M., 25/2/50.) January 18, £2,500,000 second secured loan stock with a premium of 5 per cent, secured by a trust deed dated December 30, 1949; charged on properties, benefit of an agreement for lease, certain shares, and a general charge. *£1,300,000. February 22, 1949.

Western Oxide & Paint Co., Ltd., Plymouth. (M., 25/2/50.) January 19, £5000 second mortgage, to Smith & Walton, Ltd.; charged on premises and land known as Commercial Yard, Sutton Road, Plymouth. *Nil. January 13, 1949.

Increases of Capital

The following increases of registered capital have been announced: Cloister Laboratories, Ltd., from £10,000 to £15,000. Maurice D. Curwen, Ltd., from £1000 to £10,000. Domestos, Ltd., from £7000 to £250,000. Marchon Products, Ltd., from £2000 to £100,000. Thomas Shepherd & Co., Ltd., from £20,000 to £30,000. Evans Medical Supplies, Ltd., from £450,000 to £1,000,000.

Company News

Etablissements Kuhlmann

The leading French producer of chemicals and dyestuffs has increased its capital, by drawing upon reserves, from Fr. 2196 million to 2745 million.

New German Export Company

The Eisen-und Stahl Export, G.m.b.H., Stahlex, has recently been formed in Düsseldorf to trade in iron, steel, ores and machinery. It is reported to have established contacts with Bishopsgate Steels, Ltd., London, and the Transcontinental Steel Inc., of New York and Brussels.

New Registrations

A. B. Rosen, Ltd.

Private company. (478,370). Capital £2000. Manufacturers of chemicals, disinfectants, soaps, washing materials, etc. Directors: A. B. Rosen and P. Rosen. Reg. office: El-Dor Works, Abbey Street, Northampton.

Hindshaw, Lester (Dyestuffs), Ltd.

Private company. (478,437). Capital £3000. Manufacturers of dyes, dyestuffs, dyeware, chemicals, fine chemicals and chemical products, etc. Directors: F. Hindshaw, H. M. Lester. Reg. office: Parsonage Buildings, 4 St. Mary's Parsonage, Manchester, 3.

Australian Wire and Tube

PLANS for large expansion of Metal Manufacturers, Ltd., the Australian company with many subsidiaries, are expected to result in considerable development of related secondary industries—states the Australian News and Information Bureau. New imported wire drawing plant will double production of copper wire and strand during 1950. At Port Kembla, New South Wales, a new rod rolling mill will produce 40,000 tons by the end of the year. Copper and brass tubes used in industries will be produced at the rate of 75 million ft. a year. Much of the copper required will be derived from South Africa.

Large-Scale Injection Moulding

THE principle of large-scale injection moulding of polythene is now being successfully applied by an Australian company (Industrial Products, of Adelaide) which is producing large plastic jars for the storage of chemicals. They are the largest injection mouldings in Australia and employ a special press built for the purpose. Three-and-a-half pounds of the material is shot in each operation. The whole jar, except the bottom, which is heat welded afterwards, is made in a single operation. Jars hold three-and-a-half gallons.

Chemical and Allied Stocks and Shares

ALTHOUGH best levels were not entirely held, stock markets were buoyant and more active, with British Funds higher on balance and widespread gains in industrials. Following earlier gains, there was an appreciable amount of profit-taking in shares of companies threatened with nationalisation, but, at the time of writing, buyers have come in at the lower levels.

A change of Government, it is believed in the City, would bring modification of dividend limitation and perhaps abolition of the ban on share bonuses. There has consequently been increased demand for many industrial shares. It is realised, nevertheless, that in the event of Labour victory share values would probably suffer a general set-back from the recently improved levels.

Reflecting the general tendency, shares of chemical and allied companies have been more active and mostly higher where changed, although best levels have not been held. Imperial Chemical touched 44s., before easing to 43s. 9d., Monsanto have been firm at 50s. 7½d., and Fisons steadier at 22s. 9d. Albright & Wilson changed hands around 28s. 9d., F. W. Berk 2s. 6d. shares were 13s. 7½d., and William Blythe 3s. shares were dealt in at 9s. Brotherton were 19s. 4½d., and Lawes Chemical marked 9s. 9d.

Laporte Chemicals 5s. units again transferred around 9s. 4½d., and British Glues 4s. shares were strong at 20s. 9d. Turner & Newall at 81s. lost part of an earlier rise, and Associated Cement at 77s. 9d. also came in for some profit-taking, although buying was at the lower levels.

Shares of companies connected with plastics strengthened, notably British Xylonite (65s.) while British Industrial Plastics 2s. shares firmed up to 5s., and Erinoid were 6s. 7½d. Elsewhere, British Oxygen were 94s. 6d., British Aluminium were firm at 40s. 9d., and General Refractories well maintained at 23s. The 4s. units of the Distillers Co. were little changed at 17s. 7½d. United Molasses were 40s. 6d., and Triplex Glass rose to 19s. 3d.

Borax Consolidated deferred, at 54s. 6d., have remained quiet. Improvement in Amalgamated Metal shares to 18s. 7½d. reflected hopes that the result of the General Election will mean resumption of "free" dealings on the London Metal Exchange in zinc, lead and other base metals.

Iron and steels remained more active and were generally higher. Stewarts & Lloyds were 55s. 3d., United Steel 27s. 10½d., and Richard Thomas 14s. 1½d. Elsewhere, Staveley changed hands around 78s. 3d.

Glaxo Laboratories strengthened to 45s., Lever & Unilever were better at 43s., and Boots Pure Drug rose to 49s.

Paints have attracted more attention, Lewis Berger 4s. units being 27s. as a result of the company's assets segregation scheme. Pinchin Johnson were better at 39s. 1½d.

Oils have remained unsettled, awaiting further developments arising from Britain's decision to reduce oil imports from the dollar countries. Anglo-Iranian at a little over £7 were, however, slightly higher on balance.

U.S. Synthetic Pyrethrum

SYNTHESIS of a group of chemicals closely corresponding with natural pyrethrum was announced in the U.S.A. by the United States Department of Agriculture early last year.

Foreign rights to the pending U.S. patents covering these pyrethrum-like insecticidal chemicals have now been acquired by United States Industrial Chemicals, Inc. Corresponding applications have been filed in Great Britain, Australia, India, Pakistan, South Africa, Brazil, France, Sweden and many other countries. In America the patents are held in the public interest for unrestricted use.

Preparation of Seaweed

An improved method for the preliminary treatment of seaweed intended for the production of chemical products is the subject of a new English patent (No. 633,798) by J. A. Kelly, of Kilrush, Co. Clare. Sun-dried seaweed—mostly stalks—is cut into fragments and then further dried artificially. The crushing may be done between rollers and the strips thus flattened are more easily cut by any known system, *e.g.*, adapted to act transversely on strips alternately in opposite directions. When thus cut into particles of wheat grain size they are further dried by known methods, e.g., by heated dehydrator, so that moisture content is reduced to 10-12 per cent. Varieties of seaweed mentioned as examples are *Laminaria digitata* and *L. clustonii*.

Prices of British Chemical Products

Improving Level of Demand in the North

THE general position in the industrial chemicals market remains almost the same as reported last week. Apart from an active seasonal inquiry for insecticides and fertilisers, and perhaps for items such as chlorate of soda, buyers appear to be temporising until the results of the General Election are known. Contract deliveries are being taken up according to schedule and the volume of overseas inquiry is fully maintained. There have been few price alterations of any importance and quotations in all sections of the market, including the coal tar products, continue steady. Business in the latter is of moderate dimensions and most items are in plentiful supply.

MANCHESTER.—A firm undertone persists in virtually all sections of the Manchester market for heavy chemicals, although actual movements had been few and unimportant. Delivery specifications of textile and other industrial chemicals have covered substantial aggregate quantities and fresh home trade bookings have been on a fair scale. There is a steady movement of supplies on export account. A better demand for superphosphates and other fertilisers has been reported, and most of the tar products have received a fair amount of attention, a steady outlet for xylols and other distillates being reported.

GLASGOW.—The recent increase in turnover in the Scottish chemical market has been maintained during the past week. Over the last few months there has been a steady increase in consumption of all chemicals used in plating. A number of new plating firms have been opened and, in addition, there are several in the new industrial estates which have their own plating shops. The demand for xylol and toluol has also been increasing, but there are a number of factories which cannot get into full production owing to the comparative shortage of these materials. With the new industries planned or in the course of construction in Scotland, there is every indication that the demand for chemicals will continue to rise steadily.

Price Changes

Rises: *p*-Nitraniline, salicylic acid.

Reductions: Lead, litharge, pyridine, toluol, zinc oxide.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots. d/d. £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d, to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 7d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107 per ton. (Nominal.)

Lead Carbonate.—British dry, ton lots, d/d, £115 10s. (Nominal.)

Lead Nitrate.—About £116 per ton d/d in casks.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £115 5s., orange lead, £127 15s. Ground in oil: red, £137 5s., orange, £149 5s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £124 5s. per ton, Ground in oil, English, under two tons, £143 5s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£115 15s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

(*continued on page* 314)

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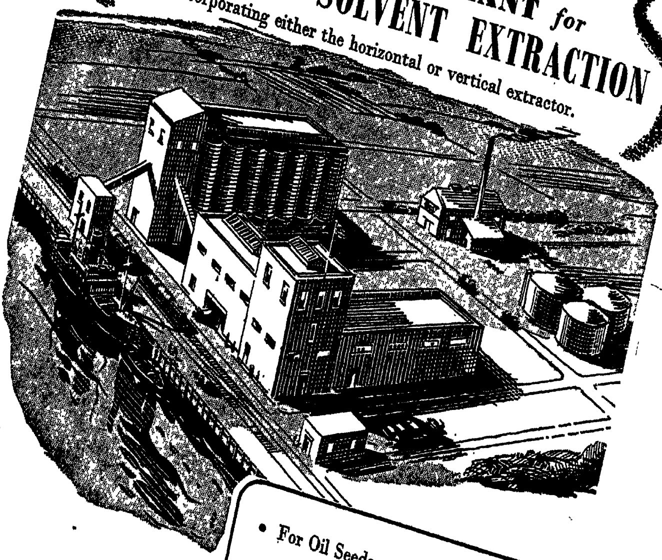

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28/4

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £61 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s. 2d. per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £20 14s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 16s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 10s. per ton, d/d, in drums; broken, £25 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

(*continued on page* 316)

Boots

Fine chemicals

Boots Pure Drug Co. Ltd. are manufacturers of the following Chemicals. Each product is subjected to strict analytical control, and represents a high standard of quality and purity.

Acetanilide B.P.C.
Acetarsol B.P.
Acetarsol Sodium.
Acetomenaphthone B.P.
Acetylsalicylic Acid B.P.
Battery Compound B.P.D. 116.
Benzyl Cyanide Technical.
Bismuth Carbonate B.P. Light & Heavy.
Bismuth Salicylate B.P.
Bismuth Subnitrate B.P.C.
Chloramine B.P.
Chloramine Technical and Commercial.
Chloroform B.P.
Dienoestrol B.P.
Diethyl Malonate.
Ethyl Cyanacetate.
Glycerophosphates.
Guanidine Nitrate Technical.
Hexobarbitone B.P.
Hexobarbitone Sodium B.P.
Hexœstrol B.P.
Hexyl-Resorcinol B.P.C.
Hydroxylamine Hydrochloride.
Iodides.
Iodine B.P.
Iodoform B.P.
Heavy Magnesium Carbonate B.P.
Malonic Acid.
Manganese Dioxide, Black precipitated.
Menaphthone B.P.
Methyl Iodide.
a-Naphthylacetic Acid.
Nicotinic Acid B.P.
Nikethamide B.P.
Phenobarbitone B.P.
Phenobarbitone Sodium B.P.
Potassium Permanganate.
Stilbœstrol B.P.
Stilbœstrol dipropionate B.P.C.
Sulphacetamide B.P.
Sulphacetamide Sodium B.P.
Sulphaguanidine B.P.
Sulphanilamide B.P.
Sulphathiazole B.P.
Sulphathiazole Sodium B.P.
p-Toluenesulphonamide Technical.
p-Toluenesulphonchloride Commercial.
p-Toluenesulphonic Acid Commercial.

Further information is available from the Wholesale and Export Department.

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C.A.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £84 15s. green seal, £83 15s.; red seal, £82 5.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in January £10 8s., rising by 1s. 6d. per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £16 3s. 6d., rising by 2s. 6d. per ton per month to June, 1950. National No. 2, £10 18s. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d. per gal.; 99%, 3s. 1d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/140°, 22s. to 23s. per gal.; 90/160°, 21s. MANCHESTER: 19s. to 22s. per gal.

Toluol.—Pure, 3s. 2d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol 98/100%.**—Nominal.

o-**Cresol 30/31° C.**—Nominal.

p-**Cresol 34/35° C.**—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: February 23. The prices of all refined oils and fats are subject to revision on February 25. The prices of all unrefined oils and fats remain unchanged during the four-week period ending March 4.

BALKAN TRADE PENDING

THE inclusion of substantial shipments of a wide range of chemical materials under current agreement between this country and Czechoslovakia is foreshadowed in an article by the British First Secretary (Commercial) in Prague in the current *Board of Trade Journal* (No. 2774, 358). This recalls that Czechoslovakia has been assured of a sterling supply of rather more than £7 million annually for the purchase of machinery and raw materials.

About £1.5 million will be allocated to the purchase in this country of 40 or 50 commodities. The most important of these, records the First Secretary, are synthetic resins and solvents for the lacquer industry, anti-oxidants and accelerators for the rubber industry, colours based on metallic and non-metal oxides, contractors' plant, artificial silk, pharmaceutical and laboratory raw materials, cotton yarn and aniline dyestuffs; for each of which a quota of £50,000 or more has been fixed.

The remaining £5 or £5½ million which Czechoslovakia may hope to have will be used in all probability for the purchase of machinery, parts and raw materials.

£2.25 m. Coke-Oven Contract

A contract to manufacture and install 88 ovens for coal and coke handling and by-product plant at a Flintshire steelworks has been secured by Simon-Carves, Ltd., Cheadle Heath, near Manchester. The contract is valued at £2.25 million, and the plant will be capable of treating 1600 tons of coal a day.

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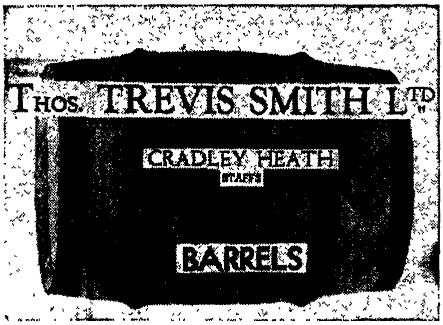
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from degreaser to sawdust bath

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order

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Creatable Resources

THAT there are two kinds of money has long been realised by most individuals and organisations. Personal bank accounts, company balance sheets, and even post-war budgets express so far as they are able this basic tenet of economic order—capital is money for conservation or creative investment and income alone is money for outright expenditure. When income is able to make additions to capital, economic man is making progress. When capital has to suffer subtractions to meet income liabilities, economic man is in a sorry state of decline. No one will deny that this is a deep-rooted instinct.

It is strange that this sense of conservation and prudence has rarely influenced modern man in his attitude towards the world's supplies of raw materials. He has paid so much attention to pounds and pence and dollars and dimes, which are no more than changing tokens; so little to the materials which in one way or another they must ultimately represent. The "dollar gap" is the immediate problem of Britain and Europe. When the United Nations points out that a rapidly expanding world population is based upon dwindling and non-renewable sources of raw materials, very little notice is taken.

The current issue (74, 1) of the *Journal of the Royal Institute of Chemistry* (itself, incidentally, in a new and attractive size and format which slightly increases its consumption of raw materials) contains a most valuable article on this subject by Dr. F. N. Woodward. His theme is concisely expressed by its title "Creating Resources." "The world population is now about 2000 million and in 50 years, if it increases at the present rate, it will be half as much again . . . man will be driven to feed, clothe, and house this staggering potential population increase from the same resources which, up to now, he has been destroying at an alarming rate and, in so doing, has failed signally to reach or maintain a reasonable standard of living for more than one-third of the present inhabitants of the earth."

This alarming picture of the future has been forcefully expressed by a number of men in recent years, notably by Lord Boyd Orr, William Vogt in his book, "Road to Survival," and Osborne in "Our Plundered Planet." Its urgency has impressed no more than a slender minority. Too many

On Other Pages

Leader:

Creatable Resources . . 319

Notes and Comments:

Nationalisation Halted . . 321
Universities and Production . . 321
" Disincentive " . . 322
Progress in Ultrasonics . . 322
Composition of Gelatin . . 323
Flour Chemicals . . 323
Arsenic in Food . . 323
Synthetic Filaments . . 324
Indian Chemical Policy . . 324
Norway's Nitrate Fertiliser . . 324
The Universities and Industry . . 325
Chemical Exports Nearly £8m. . . 327
Mechanical Seal Design . . 328
Behaviour of Selective Weedkiller 329
French Scientific Instruments . . 330
Drugs and Fine Chemicals in 1949—IV 332

METALLURGICAL SECTION

Ultrasonic Testing of Welds . . 335
Scottish Welding Exhibition . . 337
High-grade Aluminium Chloride . . 338
New Centre of N-F Metal Research 339
Breakdown of Copper Water Piping 340
Metal Casting Regulations . . 341
Antimony Oxide in the U.S.A. . . 341

Plastics Prospects Surveyed . . 342
Soil Stabilisation . . 342
Camphor Project . . 342
Chemical Plant Required . . 346
Instrumentation in Chemistry . . 346
Chemical Outlook in Canada . . 350
Israeli Potash . . 350

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nations are immersed in their own struggles for economic survival. The present problem of the Eastern and Western worlds outweighs the supply problem of the generations to come. Few note that any progress that we may make towards easing the present political and economic gaps of the world will be empty achievement if populations and demands rise while supplies of raw materials remain static—or fall.

Dr. Woodward draws attention to the great possibilities of industrial biosynthesis. Not yet accepted as a significant means of creating renewable resources, biosynthesis can nevertheless give an impressive account of itself. The German wartime use of enzymes to produce 16,000 tons of food yeast from sulphite pulp waste, and the similar Jamaican venture using sugar molasses as the fermentable carbohydrate source, are means by which chemists may one day have to balance protein deficiencies for the swollen populations. Limited land acreages can produce carbohydrates in much greater abundance than proteins.

New Swedish work has developed another enzyme process by which carbohydrates can be converted into fats by an unusually efficient fermentation synthesis. Dr. Woodward quotes a calculation showing that a 1000 lb. bullock can produce 1 lb. of protein in a day, but similar weights of soya bean seed and *Torulopsis* yeast can, in the same time, respectively produce 86 lb. and 4000 lb. of protein. The qualitative contrast between these different kinds of protein need not be stressed—the delights of bacon or rump steak cannot be denied. But for a world which may have to support 3000 million in the year 2000 the comparison 1:86:4000 will be inescapable.

Unless farmers can increase their optimum outputs of protein per time and area unit, they may be largely become producers of carbohydrates and cellulose for biochemical conversion into proteins and fats. Biosynthesis is in its infancy and what it can claim so far is only a pointer to future potentialities. Agriculture, despite its recent rejuvenation in some parts of the world, is getting on in years and its potential rate of output expansion must be measured in minor percentages per annum. Fortunately the argument that agricultural expansion must ultimately be stemmed by lack of labour is hardly logical if world population is to rise by 50 per cent in the next 50 years.

Notes and Comments

Nationalisation Halted

THE decisive check which the country administered last week to the spread of Socialist doctrine in action to the detriment of individual productiveness and initiative might well have called forth a spontaneous act of thanksgiving. There has been, instead, a widespread tendency in many responsible quarters to see the result of the General Election, because it conferred full executive powers on neither of the principal contestants, as being an unmitigated misfortune. Now that the danger has passed, few seem willing to recall what fate would almost certainly have overtaken many industries, including in all probability large sections of chemical industry, had there been no popular revolt against the Socialist objective of appropriating to the State all the means of production. Bereft of dictatorial powers, the Labour Party can now be trusted to initiate no further essays in experimental economics of a kind to which all responsible opinion has been opposed. More than this, there are now good reasons to hope that the grim results of some earlier excesses may be averted. Ten months have yet to elapse before the ill-conceived legislation to make a State industry of iron and steel comes into effect. Before then, the country will in all probability have been invited to make a more decisive choice of its Parliamentary leaders. That there will be meanwhile an interval of uncertainty is unfortunate for those who have to frame industrial policy. A likely alternative, the predominance of Socialist doctrines in all fields of production, would certainly have imposed on the makers of policy frustration of more than a temporary kind.

Universities and Production

THERE are very few ivory towers within present-day universities and in the science faculties the preservation of detachment from worldly affairs would be rendered very difficult by the increasing two-way traffic with industries. That traffic, however, is still not free or frequent enough, says Dr. W. H. Garrett, M.B.E., who, as director of production of Monsanto Chemicals, has exceptionally good qualifications to judge the effectiveness of the university-industry relationship. He acknowledges ungrudgingly the comparatively new policy which has enabled appropriate departments of chemistry faculties to serve much better the specific needs of industry, but deplores the comparative infrequency of reciprocal information—from industry to the universities—to make known "the forward picture and the technical and economic trends." The deficiency is capable of having unfortunate results such as the release to industry of graduates having only a sketchy understanding of subjects indispensable in a successful industrial career, or the training of too many trainees of one type. Dr. Garrett, speaking last week to the University of Liverpool's Chemical Society, has made out a good case for a much more intimate liaison between the universities and the industrial units. His proposals would find special places in chemical plants for members of the chemistry faculties (taking a year's Sabbatical leave) and send industrial technical staff on occasions back to the universities for refresher courses. He would like to see formed for each major industry a small liaison committee of industrialists and university people. They might help immeasurably to bring about that closer identity of viewpoint which in the U.S.A. has manifestly conferred great benefit on industries. Dr. Garrett, however, is not one of those who see the university primarily as the handmaid of industry. He was talking principally in terms of post-graduate activities and harbours no plots to reshape from outside the vital academic and research policies of the universities.

"Disincentive"

ALL proposals to improve the effectiveness of training and research depend very intimately upon the amount of money made available, which is the subject of the latest issue of "Notes on Grants to Research Workers and Students." In this the Department of Scientific and Industrial Research shows that the scale of allowances to students ranging from £220 a year to £300 (if the student is at Oxford, Cambridge or London Universities) is adequate, though certainly not munificent. The early years of a research career have never been financially rewarding, but it is not easy to produce any logical excuse for the grudging regulation, mentioned in this report, which deprives the student of half the benefit of any fees earned by teaching or demonstration work. Fifty per cent of any such rewards of enterprise is deducted from the grant. Yet it is observed in the same report that "It is considered desirable that a student should undertake a certain amount of demonstrating and teaching work." That work, however, must not exceed six hours in any one week, including time needed for preparation. Since the amount of teaching or demonstrating can only be small, it is purely petty to deduct half the payment made for it. The grants to students are exempt from Income Tax, but the DSIR would seem to be no less punitive than the Department of Inland Revenue. The attitude of mind which this reveals calls to mind the Whitehall administrator rather than DSIR. Other official documents at intervals draw emphatic attention to the shortage of university teachers. Yet young scientists, who can in most cases make a partial contribution, and who must live in Spartan fashion if they depend upon their allowances alone, must lose half the incentive to teach. It is not irrelevant to recall that theatrical and literary agents are content to take 10 per cent, and the income tax collector would allow one-fifth for earned income and then take only 15 per cent of the first £50 and 30 per cent of the next £200. It is a shoddy condition imposed upon an otherwise progressive scheme.

Progress in Ultrasonics

THE transformation of the ultrasonic vibration principle from a laboratory activity to the status of an everyday industrial technique has evidently gained considerable impetus from the enterprising practical work which has lately been carried on in South Wales (*page* 335). That was a highly specialised study, not concerned with the capacity of high frequency vibrations to produce physical and chemical change, and it has yielded some very interesting evidence of the practical scope that exists in the non-destructive testing of welded metals. That research project, like so many fruitful ones, was initiated by necessity. It was essential that welding employed at the Abbey Works, and especially the side butt welds, should be subjected to tests; and, while radiography was, of course, available, it was recognised that what was chiefly needed was the location of faults, not a photograph which in each case would require expert examination. Radiography, moreover, was deemed too expensive for large-scale use. The responsible people at Abbey Works found it worth while to set up their own ultrasonics research department, principally to adapt contemporary equipment to their particular need. The measure of their success is seen in the production of specialised apparatus employing the cathode-ray oscillograph with which even an unskilled operator can rapidly determine whether a steel weld reaches a satisfactory standard. It is in fact very much more discriminating than that, but it is in its mass-production capacity, in which such testing accounts for only 7 per cent of welding costs, that this very practical advance is most promising.

Tin Study Group to Meet

The fifth plenary session of the International Tin Study Group will be held in Paris on March 20.

COMPOSITION OF GELATIN

New Standards Defined

AMENDMENT of the definition of edible gelatin and the limits of its metallic contamination is the subject of a report by the Food Standards Committee, approved for publication by the Minister of Food.

The committee recommends that edible gelatin should be defined as being "the clean, wholesome protein which is obtained by extraction from collagenous material; free from objectionable taste and offensive odour; dissolves completely in warm water to give a clear or translucent colloidal solution; and yields not more than 3.25 per cent by weight of ash."

The limit for arsenic content (now 1.4 p.p.m. arsenious oxide) should be increased to 2.0 p.p.m., the committee recommends, and the lead content reduced from 10 to 7 p.p.m. The present limits for copper (30 p.p.m.) and zinc (100 p.p.m.) should remain unchanged.

Trade opinion was not unanimous on the question of prescribing a jelly strength test. The committee considered that it would be impracticable to impose a suitable jelly strength test, believing that, as supplies become more plentiful, a gelatin of unsatisfactory setting quality would be unlikely to find a ready retail market.

Among the organisations consulted by the committee were the Federation of Gelatine and Glue Manufacturers, Ltd., and the Association of Glue and Gelatine Distributors, Ltd.

Two months are to elapse before steps are taken to prescribe the recommendations in a Food Standards order under the Defence (Sale of Food) Regulations and to revoke the existing order (S.I. 1948, 2460).

Representations from those interested should be made by April 30 by writing to Mr. K. R. Allen, secretary, Food Standards Committee, Ministry of Food, 47 Portman Square, W.1.

Arsenic in Foods

IMPENDING changes in the statutory regulation of permissible content of arsenic in foodstuffs and beverages, originally formulated by a Royal commission in 1903, are foreshadowed by the publication by the Ministry of Food of a report of the Metallic Contamination Sub-Committee of the Food Standards Committee. The proposals, which will not be implemented for three months, to permit further representations to be made, would permit some slight relaxation of the 1903 requirements in respect of some food adjuncts (colourings, edible gelatin, etc.). The new statutory limits proposed are these:—

(continued at foot of next column)

Food	Parts per million	
	Arsenic (As)	Arsenious Oxide (As_2O_3)
1. Food colourings containing more than 10 per cent of colouring matter	5.0	6.6
2. Beverage base—		
(*a*) Total solids up to 35 per cent	0.1	0.14
(*b*) Total solids between 36 per cent and 69 per cent ...	0.5	0.7
(*c*) Total solids over 70 per cent	1.0	1.4
3. Edible gelatin	2.0	2.7
4. Dried herbs	5.0	6.6
5. Spices	5.0	6.6
6. Dried liquorice extract	5.0	6.6
7. Dehydrated onions	2.0	2.7
8. Phosphate constituents of raising powders	2.0	2.7
9. Hops and hop concentrate ...	2.0	2.7

FLOUR CHEMICALS

Possible Large Demand for Cl O_2

THE future course of a potentially important section of industrial chemical production, that concerned with high purity chlorine dioxide gas for the flour milling industry, may be determined by current discussions between two Ministries—of Health and Food—and the millers' organisations.

This was indicated in the course of an interview with THE CHEMICAL AGE by an official of Wallace & Tiernan, Ltd., the company which will be very closely identified with providing the type of gas equipment which will be required in substantial quantities when the recommendation to employ as a flour bleaching agent and improver chlorine dioxide, instead of Agene, is implemented (THE CHEMICAL AGE, 62, 235).

Wallace & Tiernan, Ltd., is in a position to make at once, and probably will be making, 85 per cent of the chlorine dioxide plant needed in this country. Within six to eight months it expects to raise that figure to 100 per cent. Until then, some 15 per cent of the total plant likely to be needed must be imported from America, because a few essential parts and constructional materials are not at the moment readily available here. Some of these are plastics materials, but tests with substitutes over the next few months are thought likely to remedy the small deficiency.

Plastics for machinery parts, although in their infancy, are thought by Wallace & Tiernan, Ltd., to have a promising future.

SYNTHETIC FILAMENTS

U.K. Technology for Australia

FOLLOWING the recent announcement of the formation of a new company, Courtaulds (Australia), Ltd., is a statement by Courtaulds, Ltd., that the Australian company has decided to locate both its factories near Tomago, New South Wales. They should be built by the end of 1953 and are estimated to cost from £A5-6 million.

One factory is planned to produce approximately 6 million lb. per annum of high tenacity. continuous filament viscose rayon yarn. For strategic and economic reasons, the Australian Government is said to attach great importance to the establishment of a factory for producing this yarn.

The other factory is to produce some 3 million lb. a year of acetate textile yarn.

20-Year Agreement

Apart from its shareholdings, Courtaulds will be associated with the Australian company under the terms of an agreement intended to continue for a minimum of 20 years. Courtaulds, Ltd., is to provide designs for the factories and supervise their construction and to assist the company to procure and install plant and machinery and to select and train key personnel.

The British company will also make available technical data and patent rights. The agreement does not cover nylon yarn.

Courtaulds has agreed that as soon as satisfactory arrangements can be made the new company will be appointed as sole agents in Australia for certain products.

It is hoped that Courtaulds (Australia), Ltd., will ultimately be able to obtain its cellulose requirements from indigenous Australian sources. Any dollar expenditure incurred by importing cellulose should be more than balanced by the saving in dollar purchases of tyre yarn and tyre fabric. Sulphuric acid, carbon bisulphide and caustic soda will, it is expected, be available from Australian sources.

Cellulose acetate flake and acetone, the main raw materials of acetate yarn, should both be available in Australia.

The outstanding performance of viscose tyre yarn during the war has established it as an industrial textile fibre of great importance. World production (excluding Germany, Italy and Japan) of viscose rayon yarn for industrial purposes is believed to have risen from about 10 million lb. in 1939 to 380 million lb. in 1948.

INDIAN CHEMICAL POLICY

Potassium Permanganate Dispute

INDIA'S demand for potassium permanganate has been estimated at about 200 tons per annum during the next three years.

The country's home production of the chemical is believed not greatly to exceed the 1946 figure of 20 tons per annum.

Protection of the industry is due to end on March 31 and, recently, the views of producers, consumers and importers of potassium permanganate were sought by the Indian Tariff Board.

The manufacturers, who stated that a new plant designed to produce 150 tons a year would soon be installed, criticised the open general licence policy of the Government as preventing the disposal of the indigenous products.

Importers urged that protection should be lifted, since the home industry could meet only a small part of the country's needs.

The manufacturers suggested that the protective duty should be continued to give the industry the opportunity to increase its capacity.

Sulphate of Ammonia

Sixty-eight thousand tons, more than one-third of the total quantity of sulphate of ammonia available in India, has been allocated to the country's tea, coffee, jute and cotton industries during the year, July, 1949, to June, 1950.

The quantities allocated are: tea 30,000 tons; coffee 5000 tons; jute 15,000 tons; and cotton 10,000 tons. In addition, 8000 tons has been directed to the United Planters' Association of South India and 8000 tons to other industries. About 124,000 tons has also been allocated to the Provincial and State Governments for use in the food growing industries.

Norway's Nitrate Fertilisers

WITH the full operation of Norsk Hydro's recently completed factory at Glomfjord, in Northern Norway, the company's capacity has increased to 150,000 tons of nitrogen a year. This is used to manufacture 1 million tons of nitrate fertilisers, the company's main product. Norsk Hydro's output is valued at £11 million a year, of which £9 million is earned from exports. Although the cost of raw materials is low, Norsk Hydro disposes of 400,000 kW of electric power a year.

In recent years the company has invested some £12 million in new plant.

THE UNIVERSITIES AND INDUSTRY

Need for Flexible Policy to Meet Changing Conditions

by Dr. W. H. GARRETT*

OUR friends who have studied natural history tell us that through the ages it is the adaptable animal that survives. We should, therefore, while preserving all that is really worth while in our traditions, prepare to meet rapidly changing conditions by increasing the flexibility of institutions.

This, I feel, can best be done by increased mutual support between the universities and industry, based on closer contact, a regular channel of information, and a joint policy-making body which will enable both industry and the universities to exploit more fully their potentialities.

The subject of relationship between universities and industry in this country is one which is of great interest to me and one which becomes more and more important as time passes and our civilisation becomes increasingly complex and competitive.

The manifold industrial advantages which this country possessed in the nineteenth century have been, in the main, overtaken by rapid advances in other countries. In fact, when the four corners of the world come armed to-day with their industrial developments, there is little we can do to shock them.

The times in which we live enforce a speeding up in our industrial tempo and a more rapid translation of ideas into practice. What I have to say largely applies to the chemical industry, widely defined, and the corresponding university faculties.

Effect on Universities

At one time, when university-trained men founded a struggling chemical industry, this was regarded by many as a profanation of the true spirit of science. Later in the 19th century, however, it was realised that without a continuous flow of new discovery the industry could only stagnate. No industrial research organisations existed at that time, and the essential impetus could only come from the universities.

Danger then arose that universities, under the pressure of industrial expansion, would concentrate on specific training rather than on real education, *i.e.*, on teaching the brain to work thoroughly on certain narrow lines instead of training the mind to think for itself.

With all the modern facilities that exist in the U.S.A. to-day, this very danger is at present a serious threat to American university life. In this country there have been continuous efforts to strike the right balance, and this danger is passed.

New Sources

What is the position to-day? With the development of the Department of Scientific and Industrial Research, the various trade research associations, and the research groups of individual companies, there is reasonable cover for the specific technical problems of industry.

Indeed, to a certain extent, some of these organisations supplement the pure research which is one of the prime functions of the university faculties.

We have too, a growing realisation on the part of industry that financial support of the work of the universities is a sound and, indeed, necessary investment if industry is to advance.

True, not all industrial concerns yet see the wisdom of giving such support unconditionally, but the number that do so is increasing annually. The extent of this support to-day is indicated by the Nuffield Trust, the I.C.I. fellowships, etc. We also to-day have a much closer contact between universities and industry in the placing of graduates in employment.

All these are excellent things, but possibly the fundamental necessity is still, to a large extent, neglected. There is no recognised and regular flow of information from industry to the universities concerning the forward picture, the technical and economic trends of industry, with the result that the equipment of graduates entering industry is incomplete.

In the worst case there may be a glut of one type of graduate and a shortage of other types, caused by changes in industrial techniques.

By the time a student graduates he has made up his mind, aided by his tutors, which of the three main lines he intends to follow—academic, pure research or industrial. I would like to emphasise here the serious responsibility that lies on the university faculty in guiding the student into the line for which he is best suited.

---

* Abstract of an address given to the University of Liverpool Chemical Society at Liverpool University on February 23, by the director of production of Monsanto Chemicals, Ltd.

The chemical industry in this country has suffered considerably through making first-class research men into second-rate managers. The industry and the country require all our high grade research ability to be employed in its most fruitful sphere.

For the first and second types of career, academic and pure research, the universities and associated training colleges provide excellent post-graduate tuition, but it does not appear to have been realised that for the man taking up an industrial career there are many other things to learn beside the fundamentals of his particular branch of science.

Post-Graduate Training

Usually, graduates leaving the university to enter industry know little or nothing of the principles of management, of factory economics and costing, or of industrial relations. The terms " depreciation," " amortisation," etc., are still a foreign language, yet normally the future leaders of industry will be chosen from these graduates.

Manpower is unlike the raw materials handled in the laboratory, in that it is variable and often unpredictable in behaviour. The economic use of manpower which, to a large extent, depends on a knowledge of the principles of good management and industrial relations, ranks high among the important factors of industry to-day.

It may take ten years of training in industry itself before it becomes apparent that a graduate can be useful in a higher post. These factors apply not only to the production chemist, but equally to the chemical and the mechanical engineer, the man on applied research and development, and the technical representative.

University Courses

True, some firms carry out a form of training along these lines, but only the largest companies can carry the necessary organisation. Even where such training exists, it is almost certain to be unconsciously biased along the lines of policy and practice of the particular concern.

I think there is no doubt that general training along these lines could best be given by suitable post-graduate courses in the universities. Most science graduates in industry to-day would, I think, rate very highly the value of such a post-graduate course in management training, factory costing and industrial relations, had it been available.

The shortage of suitable lecturers may be a major difficulty in the way of starting such courses, but in American universities this obstacle was overcome in the early years by co-operation with industry, which provided visiting lecturers from high-level executives. Such an arrangement should not be impossible in this country.

A second suggestion worthy of consideration is the possibility that industry could employ for periods of, say, a year, members of university faculties on Sabbatic leave.

Provided that the faculty members were employed by industry in posts and on work which would expand their experience in the right fields, much could be gained by both sides.

A third suggestion arises from this, that industry should make a regular practice of sending members of industrial technical staff back to universities for refresher courses. This is widely done in the U.S.A. at industry's expense and has proved to be a good investment.

Channelling of Information

This idea, if carried out, would not only help in the regular channelling of industrial information to the universities, but if they make the fullest use of these refresher students, the advantage to both sides would be well worth while.

How, then, can this close and continuous contact between the universities and industry be set up and maintained? Would it not be possible to set up a small liaison committee for each major industry, made up of leading men of that industry and representatives of the university faculties responsible for the studies appropriate to that industry?

Such a group, meeting twice a year, could do much towards improving our competitive industrial position in the world.

Members of such a committee on both sides would need to be men of broad view, progressive outlook and able to think ahead on the long term. By knowledge of world conditions and of the industry concerned, combined with information on technical advances, they could reasonably forecast requirements of that particular industry for five or ten years ahead.

Industry would have to be prepared to bear its share in any extra financial burden that such a flexible policy might lay on the universities, but the results obtained should well repay such support.

CHEMICAL EXPORTS NEARLY £8m.

Fluctuations in January's Trade

EXPORTS of chemicals, drugs, dyes and colours in January reached a total of £7,984,581. That, although slightly below the total for the same period of 1949, was £1,177,994 more than in January 1948. (THE CHEMICAL AGE, 62, 285).

Among the larger export increases (compared with last year) were copper sulphate 2046 tons (1469); caustic soda 252,357 cwt. (140,695); sodium sulphate 73,785 cwt. (43,795). Marked decreases included bleaching powder, collodion cotton, sodium carbonate and tar oil, creosote oil, etc. A few minor items (formic acid, aluminium oxide) have been omitted in the course of the periodical revision of the *Trade and Navigation Accounts of the United Kingdom* as they are no longer considered to justify individual mention.

Devaluation had its affect upon the value of imports, notably in carbon blacks from natural gases, the total quantity for January 1950 being 98,039 cwt. (or only 17,210 cwt. more than the previous year) whereas the value was £400,927 compared with £254,286.

EXPORTS

	Jan. 1950	Jan. 1949
	Gal.	Gal.
Cresylic acid	267,255	115,819
	lb.	lb.
Salicylic acid and salicylates ...	166,050	177,772
Value of all other sorts of acid ...	£171,570	£112,542
	Tons	Tons
Sulphate of alumina	2,589	3,902
All other sorts of alumium compounds	3,136	298
Ammonium sulphate	29,730	28,868
Ammonium nitrate	4,535	8,150
All other sorts of ammonium compounds	1,868	1,366
	Cwt.	Cwt.
Bleaching powder	24,233	61,902
All other bleaching materials ...	8,537	7,191
Collodion cotton	1,889	2,811
	Tons	Tons
Copper sulphate	2,046	1,469
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	29,404	34,415
	Tons	Tons
Fertilisers	2,101	5,626
Value of gases (compressed, liquefied or solidified)	£26,336	£28,910
	Cwt.	Cwt.
Lead, acetate, litharge, red lead, etc.	8,043	10,433
	Gal.	Gal.
Tetra-ethyl lead	131,130	99,001
	Tons	Tons
Magnesium compounds	1,028	791
	Cwt.	Cwt.
Nickel salts	6,250	6,576
Potassium compounds	5,385	7,579
	Tons	Tons
Salt	21,776	14,844
	Cwt.	Cwt.
Sodium carbonate...	275,399	447,300
Caustic soda	252.357	140,695
Sodium silicate	19,293	36,230
Sodium sulphate	73,785	43,795
All other sodium compounds ...	75,153	81,004
	Gal.	Gal.
Tar oil, creosote oil, anthracene oil, etc.	2,831,731	4,938,489
	Tons	Tons
Zinc oxide	827	819
Total value of chemical manufactures (excluding drugs and dyestuffs)	£4,308,214	£4,280,789
Quinine and quinine salts ...	£43,738	£62,469
	Lb.	Lb.
Acetyl-salicyclic acid	266,161	223,031
	100 International units	100 International units
Insulin	1,208,017	1,470,544
	Mega Units	Mega units
Penicillin	1,018,497	362,955
Total value of drugs, medicines and preparations	£1,756,256	£1,594,471
Total value of dyes and dyestuffs ...	£746,899	£1,051,969
Total value of paints, pigments, colours, etc.	£1,123,212	£1,285,541
	Cwt.	Cwt.
Plastic materials	52,235	36,726
Value	£657,205	£497,384
	Cwt.	Cwt.
Chemical glassware	1,490	1,691
Value	£57,105	£54,831
	Cwt.	Cwt.
Fans	6,596	5,752
Value	£178,378	£154,216
	Cwt.	Cwt.
Furnace plant	6,161	7,676
Value	£111,043	£86,120
	Cwt.	Cwt.
Gas and chemical machinery ...	32,135	26,108
Value	£380,508	£293,276

IMPORTS

	Jan. 1950	Jan. 1949
	Cwt.	Cwt.
Acetic anhydride	—	7,364
Acetic acid	—	—
Boric acid	10.550	900
Carbolic acid	—	8,168
Value of all other sorts of acid ...	£80,973	£30,863
	Cwt.	Cwt.
Borax	28,440	6,056
Calcium carbide	—	38,009
Cobalt oxides	537	402
	Tons	Tons
Fertilisers	11,045	9,721
	Lb.	Lb.
Glycol ethers and glycol ether esters	182,038	399,224
Iodine	16,000	66,050
	Cwt.	Cwt.
Potassium chloride	573,416	280,635
Potassium sulphate	27,760	29,560
All other potassium compounds ...	6,444	13,358
Sodium nitrate	—	—
All other sodium compounds ...	4,323	4,322
Carbon blacks (from natural gas)	98.039	80,829
Value of carbon blacks	£400,927	£254,236
Total value of chemicals, drugs, dyes, and colours	£2,609,934	£2,175,503
	Tons	Tons
Sulphur	32,285	31,281
Value	£307,197	£261,779
	Cwt.	Cwt.
Gas and chemical machinery ...	2,721	1,014
Value	£95,112	£22,965

MECHANICAL SEAL DESIGN

Problems of Wear and Materials

PROVISION of a pressure-tight seal round a rotating shaft is not easily procured, particularly where the sealing of fluids and gases in pumping mechanisms is essential.

Mechanical seals must, therefore, be designed to perform efficiently despite the gradual deterioration of operating conditions. Problems affecting these designs are discussed in a booklet now available from Crane Packing, Ltd., Slough, from which the following abstracts are taken.

Three principal considerations influence the performance of a mechanical seal: shaft condition—it is necessary to absorb movement of the shaft or mis-alignment of the fixed seal ring against which the seal face rotates; materials—materials used in the construction of a seal must be capable of withstanding the effect of any fluids with which they are in contact; wear—obviously the degree of wear which is imparted to the seal face and the seal ring will determine the length of life of the seal unit.

Minimum Flexibility

So far as flexibility is concerned, any mechanical seal must have a degree of flexibility which will compensate for movement or mal-alignment up to at least .125 in. free axial float, .010 in. eccentricity or whip of the shaft, and up to 1° of mal-alignment for the fixed seal ring; a leak-proof seal is generally contrived through the medium of two opposing faces, one of which—the seal face proper—rotates with the shaft in such fine contact with the other (the fixed seal ring) that leakage between the faces is impossible, either when rotating or when standing.

A seal which lacks flexibility will cease to operate efficiently when the two faces are disturbed by the type of unfavourable shaft conditions referred to above, or other influences associated with the type of service or pressures involved. It has been established that the incorporation of a rubber flexible member, either in the form of a bellows, or a U-sectioned rubber ring is the most satisfactory method of imparting the right degree of flexibility.

The materials which are used for the various components in a seal unit assembly must be selected carefully, due consideration being given to the service upon which the seal is to be used. The effect of various fluids which are of a corrosive nature on various metals is a factor about which there is ample information to enable the designer to select the most suitable metal for any particular application. Other components of the seal assembly which are of a non-metallic character present some difficulty when the conditions under which the seal is to operate are exceptionally severe, but experience has established that there are two types of rubber—synthetic and natural—which cover most applications.

Experience indicates that in this application the expectation of life, relative to temperature, is approximately 33 per cent better in the case of the synthetic rubber than of the natural product.

The third consideration, and one which has necessitated a considerable amount of research and experiment, is that of wear, which takes place through the two faces rubbing together without any form of lubrication. Little can be done to control the rubbing speed of the seal faces, which is normally expressed in surface feet per minute on the mean diameter of the faces.

The seal faces must, in modern practice, withstand rubbing speeds up to 2000 surface feet per minute, and possibly above this speed, with special arrangements to disperse the heat generated. In order to keep down the surface speed, the seal face diameter must be kept as small as possible, although in certain instances there must be exceptions to this rule where factors of greater importance have to be considered. For example: thrust—applied by two forces—the spring and the pressure against which the seal is holding. The lighter the spring loading, the less wear takes place at the seal faces, but the loading cannot be reduced very much.

Balance

Experiments have proved that 10 per cent out of balance—i.e., 90 per cent balance—is the ideal for high-pressure work (150 to 500 p.s.i.) and 50 per cent for medium pressures (up to 150 p.s.i.), the effect on life due to the loading in the latter case being negligible. Where the surface rubbing speed is comparatively low and the face diameter small, as with seals up to 1¾ in. size, it is not necessary to use 90 per cent balanced faces even at pressures up to 300 lb., which is their maximum. Balanced faces are not generally manufactured for seal sizes under 1¼ in.

BEHAVIOUR OF SELECTIVE WEED KILLERS

Largely Increased Toxicity of Oil Solutions[*]

On the basis of American results[†] dinitro-butylphenol holds out considerable promise for the control of annual weeds in peas, so for some of the initial experiments mustard and peas were chosen as representing susceptible and resistant types.

Some pots of each species were sprayed with varying concentrations in water of both compounds and others were sprayed with solutions to which 10 per cent of groundnut oil had been added and emulsified, because on theoretical grounds it was thought that the oil would increase the rate of penetration.

Immediately after spraying, the shoots from some pots were taken and the amounts of water and water-oil emulsion retained on the shoots measured. The remainder of the pots were left and counts eventually made to determine by analysis the respective concentrations which killed half the plants.

Taking first the effect of adding the oil, the results are remarkably consistent. With peas, the oil addition increased the toxic action of both compounds by ten times, while the corresponding, although less accurate, factors for mustard were of the same order.

Differing Retention

Since the oil emulsion alone had little effect, one could draw the conclusion that the oil caused an equal increase in the rate of penetration in both mustard and peas, but this leaves out of account the possibility that the retention of the emulsion might be different from that of the water spray. Indeed, it was found that, while with mustard there was no difference in retention by the shoot, the peas retained three times as much of the oil emulsion.

The final conclusion therefore reached is that with peas the increase in toxicity is a question of retention and penetration, while for mustard it is largely a question of penetration.

Now, these results raise a general point in relation to the formulation of herbicides. Some compounds are insoluble or only sparingly soluble in water and it may be commercially convenient to dissolve them in some other solvent than water, but if such a procedure is adopted the effect of the solvent must be borne in mind. For example, the esters of the growth regulating substances are insoluble in water but soluble in oil and they are normally marketed as oil emulsions.

Statements are frequently made that the esters are more toxic than the sodium salt and some of these claims leave out of account the effect of the oil emulsion in increasing penetration or spray retention. The overall effects of the ester oil emulsion may operate to make the treatment more or less selective than aqueous solutions of the sodium salt, since a greater retention is tantamount to increasing the concentration.

Comparison of Solutions

Another example of the complexities inherent in formulation relates to ammonium dinitro-butyl-phenate and some organic solvents. As part of the investigations on penetration, aqueous solutions have been compared with solutions made up by adding the nitro-phenate dissolved in ethyl alcohol to water, so that the final spray fluid contained 1—6 per cent alcohol.

It was found that the alcohol dilutions were appreciably more toxic to peas. This increase was not recorded where the solvent was acetone or when the equivalent quantity of alcohol was added to the fully diluted spray.

Returning to the experiment on the mustard and peas there remains the question of the relative toxicity of the two nitro-compounds, and here is one of those "Looking Glass" answers which make new techniques of weed control possible. In the case of the mustard, the dinitro-butyl-phenol was over four times as toxic as dinitro-ortho-cresol but it was only 0.55 times as toxic to peas. In other words, the dinitro-butyl-phenol was eight times more selective.

Roberts, in his field investigations with peas, has found that, according to the species of annual weed, the dinitro-butyl-phenol is one to four times as toxic as dinitro-cresol.

In seeking to determine the concentration of the ammonium dinitro-butyl-phenate which has the greatest selectivity in peas, a new problem has arisen, since it appears that pea varieties differ in their liability to injury.

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[*] Abstract from the paper, "Selective Toxicity and the Development of Selective Weedkillers," presented by G. E. Blackman, before the Royal Society of Arts, March 1.

[†] K. C. Barrons and B. H. Grigsby (1945), Mich. Agric. Exp. Stn. *Q. Bulletin.* 28. 145.

FRENCH SCIENTIFIC INSTRUMENTS

Impressions of the London Exhibition

by FRANK GREENAWAY, M.A., F.R.I.C.

NOT often is there the chance of seeing how our friends and neighbours on the Continent are tackling current scientific problems, so that the London Exhibition of French Scientific Instruments, at the Science Museum, Kensington, has helped to repair a regrettable gap, as well as fostering mutual understanding.

The exhibition, conceived by members of the French colony in London and sponsored by the Cultural and Commercial Counsellors to the French Embassy, owed to the ready co-operation of the Science Museum the advantage of presentation in just the right setting.

Franco-British Co-operation

M. Jean de Sailly, Commercial Counsellor to the French Embassy, when he opened the exhibition on February 8, presented the highly acceptable view that co-operation in every sphere between France and Great Britain is the first essential for a settled Europe. Understanding being the first step to co-operation, this exhibition had a significant contribution to make.

At the same ceremony Prof. E. N. da C. Andrade expressed his pleasure that new departures in science should see no break in the great French instrumental tradition of elegance combined with aptness for purpose.

The exhibition has also been the occasion for a series of lectures by distinguished French men of science, the first being of particular interest. On the opening day Prof. Edmund Bauer, professor of physical chemistry at the University of Paris, and M. Volkringer, head of the Patents and Inventions Service of the Centre National de la Recherche Scientifique (CNRS) gave an account of State-aided research in France at the present time.

The long cultural history of France has always been marked by a balance between practical pursuits and the humanities, and the tradition has been preserved from the foundation of the Collège de France in the 16th Century, through the setting up of the Paris Observatory and the Académie des Sciences in the 17th Century, through the foundation, after the Revolution, of the Grandes Ecoles for higher technological studies, to the present day.

With the coming of the era of expensive research French government support was not equal to its responsibilities, except for a brief period in the First World War, until 1939, when the CNRS emerged as a leading force in French science. An autonomous body within the Ministry of Education, it has several laboratories, provides specialised services such as a breeding station for experimental animals, documentation services and a patents service. The latter is a new body, with a limited budget, but already it is providing advice and financial help for the development of some of the 400 inventions a year—from the CNRS, from other organisations or from independent inventors. All research workers in France may look to the CNRS for support, and that support is not confined to natural science but extends to research in the human studies, philosophy, economics and other subjects.

There exist also in France other research organisations, large and small, none exactly equivalent to our own range of Government establishments but often resembling them in particulars. The chief are the Commissariat à l'Energiè Atomique and the Office National d'Etudes et de Recherches Aeronautiques. These, with the CNRS, occupied some three-quarters of the space at the exhibition, the rest being devoted to products of the French instrument industry.

Differential Polarograph

Naturally the physical point of view predominated, but there was sufficient of chemical significance to enable one to judge fairly well the high points of French achievement. The differential polarograph shown by the Commissariat à l'Energiè Atomique aroused a good deal of interest among visitors. It gives the first derivative of the usual polarographic curve, so that stationary points are rendered as peaks. The polarographic current flows through a resistance which is connected in parallel with a resistance-capacity galvanometer circuit. The polarisation potentiometer is geared to a synchronous motor so that the potential applied to the cell increases linearly with time.

Neighbouring this equipment was a neat stand and thermostat for polarographic work in which cells can be changed with ease and speed. Equally elegant is the little lathe for forming spectrographic electrodes, also shown by CEA. At the other extreme of size is the mass spectrograph for routine analysis of mixtures in the atomic weight range 4 to 60.

The ions are accelerated by a d.c. potential on which can be impressed a variable a.c. component. The masses thus scan a receiving slit and give pulses in the output, which, after amplification, are registered on a cathode-ray screen. The section of the range covered by the display is determined by the a.c. component of the accelerating voltage.

Gas analysis figured also on the stand of the Office National des Etudes et de Recherches Aeronautiques. The analyser's operation depends on the selective absorption of infra-red radiation by gases. An infra-red beam traverses first the mixture to be analysed and then a tube containing a known quantity of the gas to be detected. The gas in the second tube is heated by the radiation it absorbs. The volume of the given gas in the first tube determines the absorption of radiation and regulates the radiation transmitted to heat the second tube. The heating is recorded through a pressure charge affecting the capacity of an electrical condenser. Very small concentrations of particular species can be detected and automatic recording can be provided.

Spectroscopy has always been faced with the lack of materials of perfect transparency. Some natural crystals have useful properties, such as rock salt, which is transparent to wave lengths beyond 10 microns, but large, flaw-free samples are excessively rare. ONERA is now producing large masses (up to 20 kg. in weight) of synthetic crystals by the slow annealing of melts. Sodium chloride, potassium chloride and bromide, sodium nitrate and silver chloride have all been successfully prepared in this form.

This non-recording polarographic equipment comprises a dropping electrode support, hydrogen distribution for series working and thermostat

(Courtesy, Commissariat à L'Energie Atomique)

There is some equipment of metallurgical interest. ONERA showed a Durometer in which eddy currents induced in a test sample are used to indicate the conductivity of a metal and so give a measure of those mechanical properties which are related to it, notably hardness. In the industrial section is to be seen the microsclerometer made by the Société d'Ajustage et de Mécanique de Précision. This determines Vickers hardness without removal of the sample from the microscope and very light loads can be applied for the study of micro-constituents.

Cathode-Ray Recorder

Electrolytic polishing is being studied at the Sorbonne and the usefulness of direct records of current-voltage and resistance-voltage curves in such work has led the CNRS to design a cathode-ray recorder, in which the horizontal plates receive a voltage proportional to the voltage at the electrodes of the cell, while the vertical plates receive a voltage proportional to the apparent resistance of the cell. Visual observation facilitates direct control, while photographic recording allows quantitative records to be made.

This is a small proportion of the instruments of chemical interest shown and a still smaller proportion of the whole exhibition. General impressions, however, are valid here, and one can say that these French instruments reach very high standards of utility, robustness and appearance.

We do not seem at the moment to have a great deal to learn from the French in the sphere of chemical instrumentation, but we must be careful not to be too dogmatic on the basis of one exhibition, largely physical.

Since the end of the war, French instrument makers have had much leeway to make up; they have had to establish style as well as technique; they have often had to make up in enthusiasm what they lacked in resources.

Those of us who have been fortunate enough to meet the French technicians who came over will agree on one thing. The younger generation of instruments designers and research workers in France have a pride in their work which we should do well to match.

DRUGS AND FINE CHEMICALS IN 1949—IV

Antihistaminics and Motion Sickness

By G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

METHODS by which histamine might be rendered harmless to the tissues have been given a great deal of consideration and attempts made to create an antibody-promoting mechanism. One such compound was developed to produce artificial immunity by coupling *p*-aminobenzoylhistamine with a non-sensitising protein. Histamine was condensed with *p*-nitrobenzoyl chloride in hot chloroform/ether solution to yield imidazolylethy-*p*-nitrobenzene which was reduced to the corresponding amino compound and then diazotised. The diazonium compound was then coupled with the selected non-sensitising protein (egg albumin, etc.) at *p*H 8.1 (B.P. 562, 169).

The value of such histamineazo protein complexes is, however, open to some doubt. Symptoms of allergy have also been relieved by the use of adrenaline, ephedrine and aminophylline which have a pharmacological effect which is essentially opposite to that of histamine in certain relevant particulars. The only really effective treatment of allergic conditions, however, is based on the use of immunising injections of a specific antigen. This is not surprising since the approach is a basic one.

A recent summary of present knowledge of immunochemistry has been made during the past twelve months by Sexton ("Chemical Constitution and Biological Action," p. 377, E. and N. Spon, 1949).

This approach is based on the fact that an individual who might be the subject of an allergy is so because he has become sensitised to the allergen (or antigen) and, as a consequence, his tissues contain specific antibodies. When contact is again made with the allergen, this is believed to combine with the antibodies already present in the tissues. One effect is the liberation of free histamine which exerts one or more of its pharmaceutical effects with all the manifestations of an allergic flare-up.

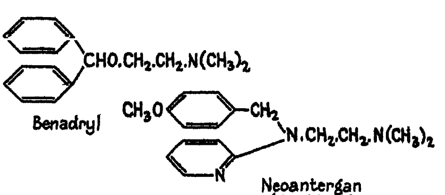
Desentisation to the specific allergen may be achieved by injection of the allergen from a certain minimum figure in increasing dosage. The antigen may be, for example, a sulphonamide drug where sulphonamide sensitivity exists; or it may be a pollen in the case of some asthmas and hay fever. Tate and Klorfajn (*Lancet*, 1944, *i*, 406) have summarised the mechanism of such desentising action by the use of the Law of Mass Action.

However, this basic desensitising treatment may be a tedious and prolonged one. A primary difficulty, and one that is often insuperable, is to identify the responsible allergen.

For some decades, therefore, a line of thought has been pursued in the hope that some non-toxic drug might be found which, structurally related to histamine, might compete with freed histamine at the site of an allergic reaction for the effective surface of a hypothetical receptor substance. Here we see implied the presumed mechanism of drug antagonism.

This line of attack was initiated by Bovet in France, who discovered substances with antihistamine action, while searching for anti-adrenaline substances.

About 1932, Fourneau, Mesnier and Staub also shared in advances in this field. After a series of disappointments due to the high toxicity of the drugs tested the first satisfactory antihistaminic drug to be made available was Antergan, which was soon replaced by the more potent and less toxic Neoantergan (Anthisan) which is N-p-methoxy-benzyl-N-dimethylaminomethyl-α-aminopyridine:—



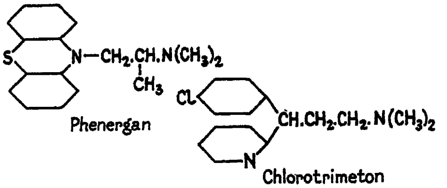
Benadryl

Neoantergan
(Anthisan)

Neoantergan, it should be understood, in common with all other antihistamine drugs which have followed, is a palliative and rarely effects any cure of the fundamental allergy. In a sense, there is a relapse which has already been noted to occur when cortisone therapy in rheumatoid arthritis or ACTH therapy in asthma is stopped. It is not to be inferred from these remarks, however, that there is, therefore, a common mechanism.

Concurrently with the developments leading to the production of neoantergan in France, similar work in the United States led to the development of Benadryl (the dimethylaminomethyl ether of benzhydryl) and Pyribenzamine, which is identical with neoantergan, except that the former is lacking the methoxyl group.

These compounds are derivatives of ethylenediamine as is Phenergan, a product of Halpern's researches. A departure from the ethylenediamine series is chlorotrimeton, in which the ethylenediamine residue is replaced by n-propylamine.

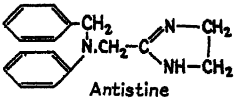


Phenergan

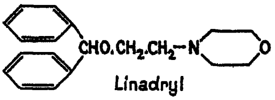
Chlorotrimeton

The pharmacological effectiveness of these drugs is approximately in the order: benadryl, pyribenzamine chlorotrimeton and phenergan.

There are certain basic features in the structure of these antihistaminics. The more potent compounds possess the ethanolamine or ethylenediamine structure and, for high potency, the chain should carry a tertiary nitrogen atom. However, the nitrogen atom may be incorporated in a heterocycle as in Antistine (N^1-phenyl-N^1-benzylaminomethylimidazoline) or in Linadryl (the morpholino-analogue of benadryl).



Antistine



Linadryl

Dimethylamine derivatives are considerably less toxic than diethylamine derivatives.

Increasing length of chain, as well as branching, leads to loss of activity. An exception to this lies in the phenothiazine-isopropylamine derivative phenergan.

Modification of the aromatic rings attached to the alpha nitrogen atom (or to the other linkage—as in benadryl) leads to decrease in activity. The introduction of p-methoxy into the benzyl group often leads to an increase in activity. Substitution of the benzyl group by thenyl or halogenated thenyl does not affect activity. (*J. Amer. Pharm. Ass., Sc. Edit.*, 1948, *37* (10), 383). A report to the Council on Pharmacy and Chemistry of the American Medical Association by Feinberg is also of value (*J. Amer. Med. Ass.*, 1946, *132* (12), 703) but much progress has been made in the development of new antihistaminics and in clinical assessment since the date of this report.

During the past twelve months or so two interesting developments in the field of antihistaminics have taken place.

The first has been in the field of motion sickness. The cause of motion sickness, however caused, is unknown, but the labyrinth is believed strongly to be involved. Many remedies have been recommended, but on the whole they have proved of little value.

In 1944, Holling et al (*Lancet*, 1944, *i*, 127) found that only preparations containing belladonna alkaloids had any effect. Numerous subsequent tests, many undertaken to control seasickness during the various sea-borne invasions during the war, have confirmed that the belladonna alkaloid, hyoscine (with or without lævo-hyoscyamine) controlled 50-60 per cent of the cases of motion sickness when administered in doses of 0.6 mg. At this level of dosage, side-effects were comparatively negligible.

During 1949, Gay and Carliner (*Science*, 1949, *109*, 359) reported that, in 1947, the antihistaminic "Dramamine" (β-dimethylamino-ethylbenzhydryl ether of 8-chlorotheophylinate) was submitted by the manufacturer to the Allergy Clinic of the Johns Hopkins Hospital in cases of allergic urticaria and hay fever. The drug was administered to a pregnant woman suffering from urticaria who, all her life, had suffered from motion sickness in street cars. Remarkably, not only was the urticaria relieved but so, also, was the car-sickness.

Confirmatory conclusions have also been reached, showing that dramamine will prevent seasickness in one hour (100 mg. dose); and reduce airsickness (Strickland and Hahn (*Science*, 1949, *109*, 356).

McEvedy (*Lancet*, 1949, *i*, 825) noted that, in 1947, patients treated on board ship with antihistaminic drugs avoided sea sickness. Subsequently he was able to show that anthisan (pyrinisamine maleate; N^1-p-methoxybenzyl N^1-pyridyl - N - dimethylethylenediamine) was at least as effective as hyoscine in controlling sea sickness.

(*To be continued*)

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Metallurgical Section

4 March 1950

ULTRASONIC TESTING OF WELDS

Basis of Large-Scale Employment in Wales

ULTRASONIC waves are generated by feeding high frequency current to a quartz crystal which vibrates, converting the electrical motion into ultrasonic wave motion at the same frequency. For most weld testing applications frequencies between 1-5 megacycles are used, *i.e.*, frequencies in the same range as are used for normal broadcasting (wave length of the Home Service of the B.B.C. corresponds roughly to 1 m.c. Circuits similar to those used in radio are used as a source of supply.

The application of ultrasonic techniques to testing welds was described and demonstrated at a recent conference of the British Welding Research Association. The paper, from which this article is abstracted, was the result of collaboration between Mr. W. S. Atkins and Mr. E. F. Lewis, describing results of experimental work at the Abbey Works, Port Talbot

The properties of ultrasonic waves are not yet by any means fully understood. Many of the classic equations worked out for waves of audible frequency have been found to apply. Others show a great variance from observed facts at the high frequencies.

However, for the purpose of weld inspection certain properties only are interesting. First, if ultrasonics are generated by a source of finite diameter most of the energy is propagated in a narrow beam—rather like a beam of light from an electric torch. These beams are not parallel and the degree of spread depends on the ratio of the wave length to the diameter of the source. The greater the ratio, the greater the spread.

When a beam of ultrasonic waves meets an interface between two media of different acoustical properties reflection occurs. In the case of two dissimilar isotropic media of great extent the amount of energy reflected is given by the following relationship:—

$$E_r = E_i \left(\frac{R_1 - R_2}{R_1 + R_2}\right)^2$$

Here E_r is the reflected energy, E_i is the incident energy, and R_1 and R_2 are the specific acoustic impedances of the two media. Specific acoustic impedance is the product of wave velocity and density of medium.

This relationship does not hold when the second medium is in the form of a thin sheet (a few wave lengths thick), nor does it hold for small inclusions of one medium in another, but it will serve to illustrate the fundamental underlying principle, *i.e.*, that when the specific acoustic impedances are dissimilar much of the energy is reflected.

It will be seen that if R_1 is great as compared with R_2, nearly all the energy is reflected. On the other hand, when $R_1 = R_2$ the formula indicates that there will be perfect transmission—the materials are said to be acoustically matched.

The following typical values for acoustic impedance will give an idea of the effect: .00004 for air; .14 for water; 4.7 for steel. It will be seen that at a steel-to-air interface the reflection is virtually complete.

Longitudinal, shear and Rayleigh waves are all used for the purpose of flaw detection, but with the techniques which will be described either longitudinal or shear waves are used—the generation of surface waves is generally avoided as they tend to confuse interpretation.

In the use of ultrasonics in weld inspection, the waves are introduced into the steel by means of a vibrating quartz crystal contained in a metal container, the whole assembly being known as a transmitting probe. They are detected by a precisely similar probe and converted into electrical impulses which are then ampli-

Testing a welded structure on the site, the operator directing the beam from the transmitting probe and observing the evidence produced by the echoes on the oscillograph screen

fied and fed to a suitable indicating device, generally, in the case of echo or resonance methods, a cathode-ray oscillograph similar to the ones used for television.

Material conducting ultrasonic waves may affect them in four different ways. Firstly, the material will damp the waves, *i.e.*, there will be internal losses which will dissipate the energy of wave motion. Secondly, since the waves may be propagated as a narrow beam, if there exists a flaw which either absorbs or reflects the ultrasonics, it will cause a shadow. Thirdly, where there is lack of homogeneity, particularly if there is an interface with air on one side, a certain amount of energy will be reflected. Finally, if the thickness of the medium is right, resonance may be set up. All these effects have been used for the detection of flaws in metals.

The first method suffers from the disadvantage that the damping may be due to any number of discontinuities in the path of the beam and there is no way of telling whether there is a single large discontinuity or a large number of small ones, or where they occur along the length of the beam.

The fundamental weakness of the shadow method is that the indication is by non-receipt of ultrasonics, thus one must be absolutely certain that the energy is getting in. In practice the usual method is either to submerge the whole work piece in a tank of water or to keep a constant flow of water or some other coupling liquid between the transmitting and receiving units and the piece. Much work has been done on these lines in Germany, but the snags for weld testing are obvious.

The resonance method is really only suitable as a thickness gauge and will detect laminations, but its use is restricted to this type of flaw.

The echo method was pioneered in this country (following upon the work of Dr. Firestone in the U.S.A.) by D. O. Sproule and his colleagues of the former Henry Hughes Company, working in conjunction with a research committee of the steel industry on the problem of detecting hair line cracks in steel.

This method is, in our opinion, the best and most powerful for weld inspection. Its strong features are that any reflection from the interior of the weld has some significance—a positive signal is used as against the lack of a signal in the shadow method, and that the most minute return signals can be amplified almost to any desired degree.

If a continuous train of ultrasonic waves were propagated into a block of material by a transmitting unit the cone shaped beam would be reflected at the bottom of the block and some would be picked up by the receiving unit. If there is a crack or other discontinuity in the material, then a part of the energy will be reflected from this and picked up by the receiving unit.

Short Cycles

To enable the waves reflected from the flaw to be distinguished from those reflected from the bottom of the test piece it is necessary to send out not a continuous rain, but short pulses of ultrasonic waves between which there are quiescent periods —each silent period being long enough for the proceeding pulse to return from the far boundary to the receiving probe. Thus the waves reflected from the flaw, having a shorter path, will arrive at the receiver sooner than those reflected from the bottom.

If the ultrasonic signals produced by the receiving unit are fed to a cathode-ray tube, so as to produce a vertical deflection of the beam while it is swept horizontally at constant speed by a time base circuit, then the time transmission and receipt of various echoes will be indicated by humps on the trace.

In the practice of weld inspection the beam, instead of being projected normally to the surface, is refracted to make an angle of about 20°. There are three main reasons for the use of a refracted beam in preference to a straight projection.

To obtain the maximum echo a flaw

should lie with its greatest dimension at right angles to the direction of propagation. Most flaws in welds lie roughly in the plane containing the weld seam. It is therefore preferable that the ultrasonic pulse approach from a direcion at right angles to the weld seam.

A .reflection is virtually complete at an air-to-metal interface; to transmit the beam from the ultrasonic probe head into the metal a coupling film of oil is used. Thus small irregularities in the surface do not introduce serious loss of energy but the exceedingly rough surface of the weld reinforcement makes transmission through the top of the weld difficult.

The third reason is that the time interval between the emission of the ultrasonic pulse and the return of the first echo where the flaw lies near the surface may become critical; thus the trigger signal and the flow signal may become so close together as to be confused.

In interpreting the echoes, there are three things which may be observed:

(a) The amplitude of the return signal, which may give an indication of the size of the flaw.

(b) The direction from which the echo comes. This may be used to distinguish reflection from a flat surface such as that of a crack and from a curved surface such as that of a slag inclusion. Also it may enable the position of the flaw to be deduced from geometrical considerations.

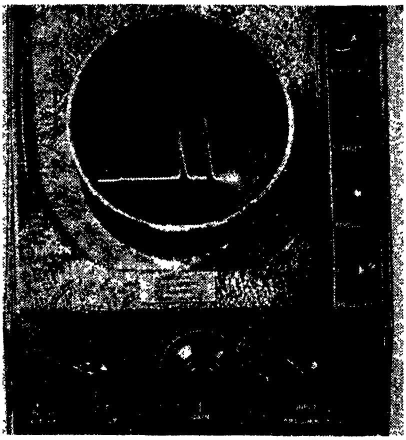
(c) By timing of the echoes the position of the flaw along the length of the beam can be deduced.

Standard Pieces

Butt welds in heavy girders have been inspected as a matter of routine for the past 15 months. At the commencement we set up standards and in the light of our experience we now feel that you may like to have our views on this important and controversial subject.

We would suggest that an entirely practicable method of setting up standards is to prepare a number of welds of the types to be inspected, each weld containing one type of defect to a predetermined degree. To what extent flaws may be permitted can then be decided either in the light of previous experience assisted by mechanical tests, or the examination of polished sections of the laboratory welds, or by means of radiographs.

The operator can have these standards by him and can by direct comparison determine whether the welds under inspection are equal to, better than, or worse than the laboratory pieces. Where several different types of defects are present in the same weld the question will depend upon the judgement of the engineer in charge, or, alternatively, laboratory samples containing the same types of defects can be made as a guide.



The oscillograph record of a welded piece, in which the first break in the beam represents a discontinuity in the metal and the second the constant echo received from the bottom of the specimen

In this work the incorporation of a reject circuit in the amplifier will greatly simplify the task of the operator. This may be set in the laboratory so that flaws which are regarded as acceptable do not show up on the screen.

Scottish Welding Exhibition

WELDING progress in plant, methods, and testing were demonstrated at an exhibition at the Engineering Centre, Glasgow, opened last week by Sir Andrew M'Cance.

Much improvement had been made in welding and the reliability of welded sheets, said Sir Andrew, but many problems associated with tensile and stainless steels remained. Special test equipment had been provided at its laboratory, Abington, Cambridge, by the British Welding Research Association, which had organised the exhibition.

The importance of welding research and its contribution to productivity were emphasised by Dr. H. Buckley, chief representative in Scotland of the DSIR.

The doctor regretted that out of a potential membership of over 1000 firms, only 200 were so far in the association. Scottish firms, he said, need not feel at a disadvantage because they were distant.

High-Grade Aluminium Chloride

CRL's Route to Improved Powder Product *

ALUMINIUM chloride is a valuable catalyst and is extensively used both by chemical manufacturers and by research chemists, particularly in synthesis work. The commercial product, a hard tooth-like substance—"dog toothed" in the trade—is unsuitable for many chemical applications. Solid materials of this nature present a variety of difficulties and the commercial article may, moreover, contain free chlorine, rendering it unsuitable for use without preliminary treatment and resublimation.

To overcome these difficulties the Chemical Research Laboratory (Department of Scientific and Industrial Research) evolved an apparatus for purifying aluminium chloride, which produced a free-flowing white powder as finely divided as flour.

Process Development

This development originated from an investigation into the synthesis of benzaldehyde as a possible route to toluene, which has been described in a paper by N. D. V. Hardy (J.S.C.I., 1948, vol. 67). This reaction required a high quality aluminium chloride and research was directed to the preparation of a finely divided material which could be more easily handled and could be used in this reaction. The objective was achieved.

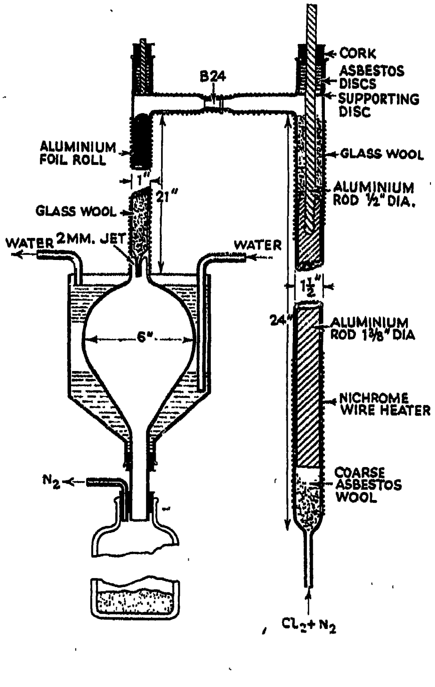
The apparatus was originally used some years ago to purify aluminium chloride prepared in the usual way, but it has now been developed further, so that the preparation of the chloride, its purification and sublimation are all carried out in the same apparatus.

In preparing aluminium chloride from aluminium and chlorine it is difficult to proceed rapidly when using glass apparatus. If the customary practice of using aluminium turnings is adopted, the metal is rapidly raised to incandescence, and hence well above its melting-point of 658.7° C. Accumulation of molten metal cannot be permitted in Pyrex apparatus; it is necessary to conduct the preparation at a sufficiently low rate to avoid melting.

The apparatus now developing aims at dissipating the heat of reaction by presenting the metal in the form of a stout rod so that heat can rapidly be conducted away from the reaction zone. The resulting aluminium chloride vapour is freed from chlorine by passing it over heated aluminium turnings or foil, and is then projected through an orifice into the centre of a water-cooled chamber. Here it is condensed into solid particles before it can reach the cold wall of the chamber, and collects in a free-flowing condition. The product is discharged from the cold chamber into the receiver; its flow is assisted by gentle vibration.

Continuous production is possible only when very pure aluminium is used. The ordinary commercial metal contains appreciable amounts of other metals as well as graphite, and these inevitably lead to difficulty as soon as a sufficient amount of impurities has accumulated to prevent proper functioning of the apparatus.

The apparatus has been used on what might be described as a large laboratory scale and has proved fully efficient. For commercial production further development would naturally be required, but it is considered that the process should be applicable to commercial needs.



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NEW CENTRE OF N-F METAL RESEARCH

Research Association's Advanced Equipment

RECONSTRUCTION of the original laboratory block, which was destroyed by bombing in 1940, has given the British Non-Ferrous Metals Research Association an opportunity to provide itself with facilities for metal studies which it previously lacked.

Laboratories in the new building are devoted to chemistry; physics; mechanical testing (high temperature fatigue and creep, creep of lead, etc.); metal finishing and electroplating; corrosion; metal working and foundry work. There is also a liaison department for testing vitreous enamels in aluminium, etc., and a comprehensive library and information section.

Industries served by the association are numerous, with widely differing plant, process and material problems, and some 37 researches are at present in progress.

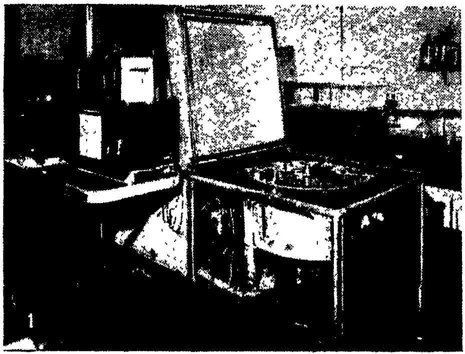
The photographs reproduced below were supplied by the association and show apparatus, all of which was designed and constructed in its workshops.

1.—*Apparatus for continuous measurement and recording of electrode potentials of corroding metal-specimens or the corrosion current flowing between dissimilar metals immersed in the same solution*

2.—*The electron diffraction camera used for the identification and examination of corrosion and oxidation products which form thin films on metals*

3.—*Centrifuge for separation of primary constituents from semi-molten metals. A specimen, contained in a graphite pot, is melted by a small tube furnace and centrifuged at the desired temperature. The e.m.f. from the thermocouple is picked up from contacts at the centre by copper rings*

4.—*Battery of machines for measuring the resistance to deformation of metals at elevated temperatures (creep). Constant loads of up to 2¼ tons can be applied and temperature controlled to ± 0.5° C*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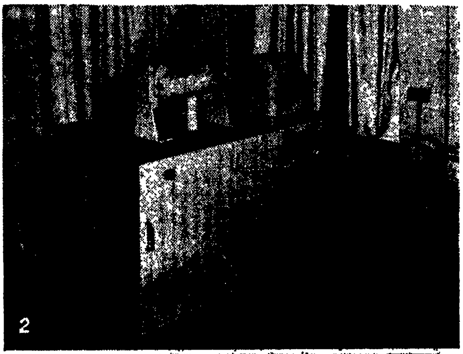
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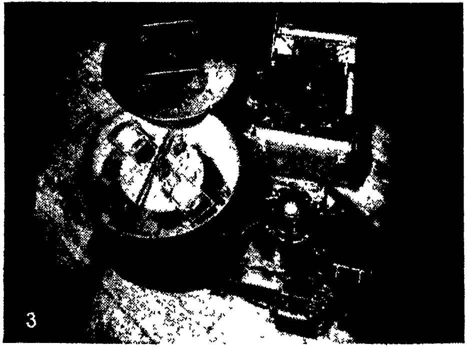
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Breakdown of Copper Water Piping

Some Results of Research into Pitting Corrosion

THE British Non-Ferrous Metals Research Association has for several years been studying the behaviour of copper in supply waters, particularly the pitting type of corrosion which occurs occasionally in certain districts, especially in cold water pipes. The number of pipes affected is extremely small compared with the total quantity in service. Recent work has revealed the main cause of this type of corrosion in cold water pipes, and the following statement has been made for the guidance of manufacturers and users of housing tubes.

Equally Susceptible

This statement is based upon the association's own experimental work coupled with a detailed survey of available service information; it is made with the approval of the committee advising the association on its research on this matter.

There is no evidence to establish the superior corrosion resistance of either of the two grades of copper allowed by the British Standards for light gauge copper tubes for water, gas and sanitation (B.S. 659: 1944) and for copper tubes to be buried underground (B.S. 1386: 1947). The information available suggests that the two materials—phosphorus-deoxidised non-arsenical copper (B.S. 1172: 1944) and phosphorus-deoxidised arsenical copper (B.S. 1174: 1944)—are equally satisfactory in service if both are free from the carbonaceous films referred to below.

There is strong evidence that the pitting corrosion of copper cold water pipes sometimes experienced in certain waters is usually due to the presence of carbonaceous films, which may be produced inside the tubes by some manufacturing conditions.

Pitting corrosion of copper pipes does not occur in the majority of supply waters in this country, even if carbonaceous films are present. There is as yet no clear evidence concerning the effect of carbonaceous or other films, originally present, on the serviceability of copper tubes in hot water systems.

A review of the evidence on which this statement was based is given by the association. This says that two types of corrosion of copper water pipes have been observed. One causes the green staining in baths, wash basins, etc., which is occasionally experienced with waters containing a high proportion of free carbon dioxide. In such cases slight uniform corrosion occurs which does not appreciably reduce the useful life of the pipe. The cupro-solvency test included in the usual water engineers' analysis of a supply water indicates whether the water is liable to give green staining if used with copper tubes.

The other type observed is pitting corrosion. This may cause failure of copper pipes by pinhole leaks, but has only been known to occur in a small number of supply waters in this country. It may occur in either hot or cold pipes but rarely in both with the same water.

Hot water pitting appears to be confined to certain soft moorland waters whereas cold water pitting, which may cause failure in quite short periods, is mainly confined to moderately hard borehole waters, although its incidence bears no apparent relationship to the usual water analyses. Recent research has, however, shown that most supply waters contain a natural inhibitor which prevents pitting; trouble is experienced only in waters containing no inhibitor. The inhibitor has not yet been identified and may be different in different waters.

Failures Analysed

An analysis of 104 failed tubes reported to the association during the last 10 years showed that seven were of tough pitch arsenical copper, 33 of tough pitch non-arsenical copper, 32 of phosphorus deoxidised arsenical copper and 32 of phosphorus deoxidised non-arsenical copper. (The tough pitch copper pipes would not now conform to B.S. 659: 1944 or B.S. 1386: 1947, both of which specify phosphorus deoxidised copper.)

These figures do not give a measure of the probability of failure occurring with a given type of copper. Thus, while at first sight tough pitch arsenical copper appears to be the most satisfactory material, this conclusion is not justified since it is known that comparatively few tough pitch arsenical tubes have been installed.

Owing to the impossibility of obtaining data on the numbers of tubes of each of the types in use in the areas where failures have been observed, the relative merits of the various materials cannot be established by this analysis of failures. It is also impossible because copper pipes may differ in respects more important than composition.

Two cases have been investigated in which both arsenical and non-arsenical deoxidised copper tubes were in the same hot water installation and in which failure occurred in a non-arsenical copper tube. In the first case, failure occurred in the horizontal flow pipe—the position in which failures usually occur in hot water systems—and the arsenical return pipe was slightly pitted. In the second case the arsenical copper pipes were unattacked but it is not definitely known what positions were occupied by the two types of copper.

Following the observation of carbonaceous films in a number of pitted tubes, determinations were made of the amount of carbon in the scale on the previously-mentioned 104 failed tubes and on 17 sound tubes taken from service in areas where pitting has occurred. A close correlation was found between the amount of carbon present and the incidence of pitting in cold water, as shown in the following table.

OCCURRENCE OF CARBON IN COPPER WATER PIPES

Weight of Carbon, mgs/sq. dm.*	Cold water pipes Pitted	Cold water pipes Un-pitted	Hot water pipes Pitted	Hot water pipes Un-pitted
Less than 1.0 ...	7	12	3	1
1.0—1.9	10	1	8	0
More than 1.9 ...	63	0	13	3

*1 sq. dm. is approximately equal to the internal area of a tube 6½ in. long by ¾ in. nominal bore.

Out of 80 cold water failures, 63 had more than 1.9 mgm. of carbon per sq. dm. and only seven had less than 1.0 mgm./sq. dm., while out of 13 unpitted cold water pipes none had more than 1.9 mgm./sq. dm. and all but one had less than 1.0 mgm./sq. dm. The correlation between the presence of carbonaceous films and the occurrence of pitting in hot water pipes is less definite.

These figures indicate that carbonaceous films were responsible for at least three-quarters of the cold water pipe failures examined. Some at least of the remaining failures are thought to be due to a certain type of oxide scale formed in the tubes during manufacture. It is believed that the carbonaceous films are formed during manufacture by decomposition of remnants of drawing lubricant when a non-oxidising atmosphere exists in the tube during annealing. The only type of oxide scale with which pitting has been associated is a closely adherent, shiny, reddish layer.

Both carbonaceous films and the oxide scales just described lead to pitting in waters which do not contain the inhibitor by providing large cathodic areas which localise attack at pores in the film or scale. There is ample evidence that copper water pipes free from such carbonaceous films and oxide scales are satisfactory even in uninhibited waters.

Failures of copper water pipes are encountered in relatively few areas in this country, yet it is almost certain that some of the pipes installed in other areas will have contained carbonaceous films or oxide scales of the above type. It can be concluded that the presence of such films or scales will initiate pitting and lead to failure only in supply waters which do not contain the inhibitor referred to.

Metal Casting Regulations

NEW regulations affecting metal casting procedure have been made by the Minister of Labour (The Foundries (Parting Materials) Special Regulations, 1950). The regulations, which apply to all metal casting factories, prohibit the use as a parting material of any substance containing compounds of silicon, calculated as silica, exceeding 3 per cent, or of dust or other product of fettling or blasting. There is no prohibition of the use of natural sand, zircon, calcined china clay or aluminous fireclay, calcined or fused alumina or sillimanite, if they contain no other silica.

Antimony Oxide in U.S.A.

A NEW smelter, costing $1.75 million and capable of producing 9000 tons of antimony oxide a year, as well as antimony metal, has been put into operation at Stibnite, Idaho, by the Bradley Mining Co., of San Francisco.

Concentrates from Stibnite were formerly shipped to the El Segundo plant of the Harshaw Chemical Co. for processing, but now the antimony ore is processed at Stibnite and only the finished antimony metal shipped.

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PLASTICS PROSPECTS

Serious Rise in Production Costs

A CAREFULLY considered review of the problems confronting the plastics industry was made by Mr. Kenneth M. Chance, chairman of British Industrial Plastics, Ltd., at its annual ordinary general meeting held in London last week.

During the year ending October, 1949, stocks of urea were almost exhausted, and owing to anticipated supplies from this country not coming up to expectations it had been necessary to purchase from Germany, during the nine months ended June 30, 1949. This German urea had cost £17,000 more than would have been paid for urea made in this country.

Higher prices had also had to be paid for formaldehyde, wood pulp and white pigment, while in addition, packaging costs had greatly increased.

Fortunately, the peak of rising costs was now passed, as ample supplies of home-made urea became available in June.

The friendly co-operation of two competitors in the moulding industry was particularly referred to by the chairman, who stated that in these days when the British industrialist is so often maligned he was glad to be able to place on record the assistance of these firms, one of which had enabled his company to tender for and receive an order for a special moulding, while the other had loaned an injection press, pending the receipt of one on order.

Trading profits were £340,515 as compared with £383,448 for the previous year. The difference in profit, however, was not so great as it at first appeared as £20,000 had to be written off for disposal of stock.

Export during the year under review had nearly equalled in tonnage the total sales of moulding powders in 1939 and exceeded them in value.

Despite difficulties caused by the devaluation of sterling the chairman expressed confidence in the future, and referred to the completion of the new £400,000 factory which would double production.

Rubber-Paper Resists Chemicals

Papers with considerably improved resistance to water and chemicals (24 hours' immersion in 5 per cent solutions of standard acids) are claimed to have been made available by the incorporation in paper at the beating stage of a new neoprene rubber (Latex 735) produced in the E. I. Du Pont laboratories in New Jersey. The heated paper is expected to find practical uses in the packaging of chemicals and probably of fruit.

SOIL STABILISATION

Highly Effective—But Costly

EXCEPTIONALLY effective results in a new chemical approach to the problem of consolidating mud surfaces are claimed by a committee of civil and chemical engineers working at the Massachusetts Institute of Technology.

The actual stabilisation process is based on calcium acrylate, an organic chemical which is adsorbed by the soil particles. The later addition of two other compounds, sodium thiosulphate and ammonium persulphate, causes the calcium acrylate molecules to lock themselves together. Thus the soil particles are joined in a simple, fast chemical reaction.

The binding action begins two minutes or less after the mixing has taken place, and five hours after treatment the soil is an elastic mass with tensile strengths from 5 to 10 p.s.i.

" If the stabilised soil is allowed to dry in air for a week or more," says the report, " tensile strengths of 500 p.s.i. or even more are obtained—but this gain in strength is accompanied by a loss in elasticity. The soil becomes much harder.

" Rewetting of the dried soil causes a return of the material to its original rubber-like consistency.

"In the recent MIT tests of the process, a stabilised soil block 3-in. thick withstood a 16-lb. steel ball dropped on it from a height of 7 ft. The ball rebounded about 6 in. without causing any damage to the section."

The committee states, " The present cost of the chemicals is still high, but there is reasonable hope that if the chemicals were manufactured in mass production their cost would be substantially reduced."

Camphor Project

THE possibility of manufacturing camphor from a common weed, known in Ceylon as madurutala, is being investigated by an Indian industrialist, Mr. K. G. Chacko.

The Indian Institute of Forest Research has proved that an acre of madurutala can produce 80 lb. of camphor and 60 lb. of camphor oil, Mr. Chacko asserts.

The price of camphor in the local market today is Rs.10 per lb.

Mr. Chacko has also suggested that the Government should utilise the country's prolific Kone trees for the cultivation of lac on a commercial basis. Home industries, he says, could absorb anything such a local industry produced.

The Chemist's Bookshelf

ENCYCLOPÆDIA OF CHEMICAL REACTIONS, Vol. III. Compiled and edited by C. A. Jacobson. New York: Reinhold Publishing Corporation. London: Chapman & Hall. Pp. xi + 842. 96s.

The first two volumes of this work have already been reviewed here (THE CHEMICAL AGE, *55*, 575; *60*, 165) and those familiar with the presentation of the material in those volumes will find no change in principle in the present one. The elements which have been added to this compilation of the published reactions of the elements and their simple compounds are as follows, the numbers denoting the separate entries for each element: cobalt, 822; niobium (under the American name, columbium) 58; copper, 611; didymium, 10; dysprosium, 5; erbium, 65; europium, 8; fluorine, 89; gadolinium, 27; gallium, 38; germanium, 185; gold, 148; hafnium, 3; holmium, 1; hydrogen, 252; illinium, 1; indium, 59; iodine, 307; iridium, 76. Thus, 34 elements in all have been covered in the first three volumes.

This list of elements calls for some comment. The extensive range of reactions listed for germanium and the surprisingly small selection revealed for fluorine are worthy of note. It is doubtful how far reactions listed under didymium can be regarded as properly included in the system—although one is less inclined to criticise extensions of the plan than omissions. There is little, however, that can be said in favour of the inclusion of illinium. It is true that in the introduction to this volume the editor explains that the Encyclopædia " is not designed to present the latest views of chemistry and chemical technology, but rather to summarise the facts presented in the published literature. Its users will therefore have the opportunity to evaluate previous experimental work when applied to present problems." It is doubtful whether any dialectic can justify the inclusion of information known to be incorrect, even in a work which is confessedly a simple compilation rather than a critical survey. It is unfortunate that it was not possible to begin the reactions of iodine on a fresh page. The running on directly from indium to iodine, in the middle of a page with no indication of a break, is a trifle confusing.

Such criticism does not invalidate the fact that the new volume will be cordially welcomed. Its usefulness as a whole can perhaps best be gauged by the frequency with which the reviewer finds occasion to wish that the elements under the second half of the alphabet had received the same attention as these first 34 elements. The excellent name and formula indexes of reagents and products of reaction permit easy reference.

It is regrettable, though presumably unavoidable that, although there are slightly fewer pages in this volume than in Volume II, the price is one-third higher. However, those possessing the earlier volumes and aware of the many occasions on which they have found them valuable for reference, will not consider even this price prohibitive.

POLISHES: THEIR RAW MATERIALS AND MANUFACTURE. By Dr. J. and A. Davidsohn. 1949. London: Leonard Hill, Ltd. Pp. 175. 15s.

The production of polishes calls not only for purely operative skill, but also demands a thorough knowledge of the raw materials and of the processes of manufacture. The practical man, working to given specifications, not infrequently finds himself in difficulties when some of the raw materials are involved in a specification unobtainable in the necessary quality, etc. A welcome feature of the book is its treatment in detail with substitutes for scarce raw materials, mainly with British substitutes for montan wax (described in 1946 by the Fuel Research Board in Technical Paper No. 52) or with other synthetic waxes of British origin. The book takes account of a number of polishes, in addition to shoe and floor polishes, and the authors have included much material derived from their own practical experience and recent research. An appendix deals with tables and conversion factors and with some simple analytical tests.

Technical Publications

ACIDS too corrosive to be handled by any commercially available metallic alloy require special pumping equipment. Two types of SRL rubber-lined sand pump for standard and heavy duty are described in bulletin No. P.9-B.6 now available from the Denver Equipment Co., Colorado, U.S.A., which gives instructions for installation, operation and maintenance.

* * *

NEW applications of the detergent and wetting agent Santomerse No. 1, in the rubber industry are described in technical service bulletin No. 6A/1 now available from Monsanto Chemicals, Ltd., London. Surface tack of freshly sheeted rubber is shown to be much reduced by treatment with aqueous solutions of Santomerse and its effects on plying up and aqueous suspensions are explained.

* * *

PHONIC motor timing devices as incorporated in the crystal time standards used in laboratories are described in a bulletin (B-601.C) recently issued by Muirhead & Co., Ltd., Beckenham, Kent. Two types are described one (D-199) with one commutator and the other (D-193) with two.

* * *

COMPLETE papers and reports of discussions and proceedings of the National Smoke Abatement Society conference held at Harrogate last year are now available in booklet form. The question of cost of installing plant for smoke abatement was not apparently discussed, and it would be of interest to know how far this has barred, or led to the deferment of, a number of promising projects.

* * *

GUIDANCE to ensure consistency of weld size and strength, production of spot welds of uniform quality, etc., is given in a booklet "Recommended Practice for the Spot Welding of Low Carbon Mild Steel Sheet" now available from the British Welding Research Association, London, as one of its Techniques and Memorandum series.

* * *

A WIDE variety of subjects is covered in the spring list of books published by Ernest Benn, Ltd., and includes "The History of the Gas Light and Coke Company," by Stirling Everard; "Terrace's Notebook for Gas Engineers and Students," by John Terrace; and "Civil Engineering Drawings, Specifications and Quantities," by J. Marshall Roger.

THE January issue of the Nickel Bulletin (the Mond Nickel Co., Ltd.) contains an article by W. H. Richardson, chief metallurgist of Langley Alloys, Ltd., on "Casting in Nickel-Molybdenum and Nickel-Molybdenum-Chromium Alloys." Such alloys, highly resistant to the attack of hydrochloric and other non-oxidising acids, have been available for some time in the U.S.A. (Hastelloy, Chlorimet and Chemalloy). Development here began at the end of the war and the article describes the properties of the series of alloys marketed as Langalloy. The issue includes many abstracts of interest relating to the performance of nickel alloys in chemical processes.

* * *

INCREASING activities of the Engineering Centre, Ltd., Glasgow, are reported in its quarterly news bulletin (No. 7, January, 1950) now available. The centre, which started three years ago with 127 firms now has 307 members, and is playing an increasing part in all engineering matters.

* * *

AN excellent example of informative publicity, in this instance to encourage wider use of glycerin and its derivatives, is the booklet being distributed by the Glycerine Producers' Association, New York. This provides a very comprehensive review of the essential characteristics of glycerin and mixtures and solutions, including much material worth preserving for reference purposes. Most of America's glycerin still comes from the soap makers and fat splitters—some 200 of them, with an increasing supplement from the petroleum industry, based on the chlorination of propylene.

* * *

THE great development of recent origin of synthetic waxes is reflected in the new 16 pp. catalogue produced by Glyco Products Co., Inc., 26 Court Street, Brooklyn 2, New York. It is concerned with the commercially pure products of the amide and ester type and offers much essential information on such topics as solubility, specific gravity, melting point, flash point, colour and acid value. The marked interest in these synthetic materials is intensified by the relative expensiveness and scarcity of the national products and the multiplication of the fields in which the substitutes are being successfully applied.

· HOME ·

More Pharmacists

The number of British pharmacists rose to 25,662 last year, states the Registrar of the Pharmaceutical Society. The increase (214) was the largest since 1939.

Lever Memorial Unveiled

A memorial to the 1039 men and women from the Lever Brothers organisation who fell during the war, was unveiled at Unilever House, London, on February 15 by Sir Herbert Davis, joint vice-chairman of Lever Brothers & Unilever, Ltd.

Prices of Refined Oils

The Minister of Food announces that no change will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period ending on April 22.

Stainless Steel Tubing

A further rise in the cost of stainless steel tubing is authorised by a new Ministry of Supply order, the Control of Iron and Steel (No. 77) Order, 1950. An increase in the permitted maximum price of mild steel wire flats is also notified in this order, which became effective on February 28.

Coal Output Reduced

Production of coal in Great Britain last week fell slightly, to 4,339,800 tons, compared with 4,352,200 in the previous week, but was 5200 tons higher than the same week last year. The first eight weeks of this year gave 34,322,700 tons, which is more than half a million better than the same period of 1949.

Britain's Largest Technical College?

The Royal Technical College, Glasgow, has become the largest technological college in Great Britain, declared Sir James French, when he presided at a meeting of the governors on February 14. The annual report showed that for the session 1948-49 there were 2425 day and 3619 evening students, 10 per cent more than the previous session. Dr. D. S. Anderson, the director, said that, compared with pre-war sessions, there were now two and a half times as many day students and nearly twice as many evening students. Extra accommodation has been provided by erecting light structures in the wider corridors on several floors of the building. This had added one major and one minor laboratory, one departmental laboratory, and 11 staff rooms.

Alum Chemicals for the U.S.A.

Alum chemicals, manufactured by Peter Spence & Sons, Ltd., at the company's recently completed plant at Widnes, are being imported into the U.S.A. by C. Tennant, Sons & Co., New York. The English products distributed by the Tennant company include ammonia alum, potash alum, and iron-free aluminium sulphate.

Freeing Imports

A Board of Trade regulation, conforming with the policy of liberalising inter-European commerce, dispenses from March 1 with the need for individual import licences for a number of additional commodities, among them quartzite, abrasive soaps (containing less than 6 per cent anhydrous soap), soapless detergents, carboys and carboy covers.

Chemical Research Fellowships

Applications for one Ramsay Memorial Fellowship for chemical research will be considered by the trustees in June. Value of the Fellowship, normally tenable for two years, will be £400 a year, to which a grant for research expenses may be added, not exceeding £100 a year. Applications should be forwarded to the joint honorary secretaries, Ramsay Memorial Fellowships, University College, London, not later than April 17.

Biochemistry Course

A series of lecture demonstrations in biochemistry will be held in the chemistry and biology department of Acton Technical College, W.3, during the summer term. Dr. A. E. Dender, who is the lecturer for the whole course, will speak on "The Elements of Nutrition," "Enzymes, Their Nature and Function," and "The Metabolism of the Living Cell." Registration forms are obtainable from the Principal of the College.

2100 Years' Service

The Triplex Safety Glass Co., Ltd., and its subsidiary, Quickfit & Quartz, Ltd., of Stone, Staffs., are forming a "21 Club" for employees and directors with 21 years' service. It is believed that about 100 already qualify, including Mr. Kenneth Horne, the sales director. Sir Graham Cunningham, chairman and managing director of Triplex, who will qualify for membership at the end of the year, will preside at an inaugural lunch, probably at Birmingham, at which every member will be presented with a watch, cigarette-case or silver salver.

PERSONAL

DR. W. H. GARRETT, director of Monsanto Chemicals, Ltd., was this week presented with the Liverpool University Chemical Society's medal, which is awarded annually for distinguished service to chemistry in the academic or industrial sphere. The doctor, who joined Monsanto in 1917, was appointed to the board in 1935, and became director of production ten years later. Dr. Garrett addressed the society on the subject of universities and industry (*page* 325).

MR. **WILLIAM WILLIAMS**, of the chemicals division of Lever Brothers (Port Sunlight), Ltd., has been awarded £10 for an idea which will result in an economy of the division's use of steam. The presentation was made by Mr. G. A. I. Nairn, chairman of the company. Mr. Williams, who has been with Lever Brothers for 37 years, received a similar award less than a year ago.

MR. **JOHN WILLIAM RAMSDEN**, of Wyke, Bradford, sailed last week on the *Queen Mary* to join the technical staff of the Bradford Dyers' Association's Canadian subsidiary.

Liverpool and District Branch of the Institute of Export on February 20 elected as chairman for the ensuing year MR. **FRED H. HUTTY**, managing director of Northern Industrial Chemicals, Ltd.

MR. **E. S. WADDINGTON**, of the industrial department of Philips Electrical, Ltd., has been appointed to the executive committee of the International Welding Congress of 1951.

MR. **IAN FERGUSSON**, chairman and managing director of Evans Medical Supplies, Ltd., has been elected to the grand council of the Federation of British Industries for the next three years.

Obituary

MR. **ARNOLD R. CLEMINSON**, chairman of Reckitt & Colman, Ltd., Hull, died last week. He was 66 and had been with the company since 1898. In 1909, he was appointed secretary and, ten years later, became a member of the board. Mr. Cleminson played a leading part in the negotiations for the merger with Colman's in 1938.

CHEMICAL PLANT REQUIRED

AN American consultant has asked THE CHEMICAL AGE for information regarding chemical plant manufacturers interested in supplying machinery for two new factories, one for the production of penicillin and the other to produce ethyl alcohol from sulphite waste liquor for paper plants.

Machinery needed, some of the orders for which could be placed in the United Kingdom, includes the following:—

1, agitator with mixing tanks; 2, air conditioning apparatus; 3, air compressor and filter; 4, steel tank air receivers, pressure air receiver; 5, plant scale autoclaves; 6, treatment system for feed water boiler; 7, steam boiler: 8, distilling columns; 9, solvent extraction columns, condenser for fractioned redistilling solvent; 10, distilling off and stripping solvent column; 11, water cooler, natural draught cooling tower; 12, water demineralisers; 13, distillery equipment; 14, high-vacuum freeze driers; 15, liquid-liquid extractors, counter current vessels and agitators; 16, fermenters, fermentation equipment; 17, continuous rotary filters; 18, fittings; 19, gears; 20, labelling machines for cylindrical bottles; 21, 96 electric motors (many explosion proof) from 0.25 to 15 h.p.; 22, low-pressure mercury vapour quartz lamps; 23, pipes; 24, pumps with various output from 2 to 80 m^3/hour; 25, refrigeration machinery; 26, automatic scales, filling and capping 20,000 sterile bottles a day; 27, plant scale water stills, distilling 10,000 litres, redistilling 3000 litres; 28, alcohol fractionating stills for sulphite waste liquor; 29, air receiver steel tanks; 30, tubes; 31, stainless steel vessels, mixing vessels, seed vessels, storage vessels; 32, bottle washing, drying and sterilising machines, 20,000 a day; 33, machinery for production of yeast from pentose of sulphite waste liquor ; 34, steam power for the production of electricity.

Small glass bottles as containers for penicillin are also required.

Instrumentation in Chemistry

THE application of physics to industrial problems at Billingham was the subject of a paper read by Dr. N. P. Inglis, director of I.C.I.'s metals division, to members of the Physical Society at Billingham last week.

Chemical industry's demand for continuously-recording instruments was now firmly established, said Dr. Inglis. They opened the way to automatic control of plant operations.

By the use of infra-red or ultra-violet absorption spectroscopes, analysis of fairly complex materials could be carried out in a few hours, but ordinary chemical analysis would take at least a week, he said.

The Physical Society visitors had the opportunity of viewing an exhibition of instruments used at Billingham.

◆ OVERSEAS ◆

Cyclotron Destroyed

The cyclotron at Princeton University, one of the first to be installed in the U.S.A., is reported to have been destroyed by a fire, the cause of which is not yet revealed.

Anti-Trust Suit

The U.S. Government anti-trust suit against E. I. Du Pont de Nemours & Co., alleging that the company monopolised the production of cellophane, has been started by the U.S. Government Attorney. The hearing is likely to be deferred until November.

Winnipeg's First Refinery

Canadian Kellogg, Ltd., has been awarded a contract by Imperial Oil, Ltd., for engineering and constructing a complete new refinery in Winnipeg, Manitoba. It will have a capacity of 12,000 barrels per day and is scheduled for completion by May, 1951. This is Winnipeg's first refinery and will include an atmospheric and vacuum pipestill, a fluid catalytic cracking unit, a treating plant for gasoline and middle distillates, an electric substation and a utility plant.

U.S. Export Controls Lifted

Export controls on a number of important minerals, ores and metals have been lifted by the U.S. Department of Commerce. The freed commodities are: Fluorspar; kyanite and allied minerals; copper ore and concentrates; nickel ore, concentrates and matte; zinc ore and concentrates; battery shells and parts; quicksilver or mercury; chromium or chromite ores and concentrates; manganese ores and concentrates; titanium, ilmenite, and rutile ores and concentrates; manganese metal and alloys; and insulating material (except porcelain, glass and rubber).

Chilean Oil Exploitation

The first part of the Chilean Government's plan for the domestic production of oil is completed, according to a statement by the vice-president of the Industrial Development Corporation. At a cost of Pes. 550 million, 29 wells had been sunk at Cerro Manantiales, and eight in other parts of Magallanes Territory; 16 of these were in operation and the total output was 2000 barrels daily. An agreement had been concluded with Uruguay for the supply of some $2 million worth of crude oil during 1950. A similar agreement was being sought with Argentina.

Medical Company's Pakistan Branch

Evans Medical Supplies, Ltd., has opened a branch establishment in Karachi to serve East and West Pakistan. Mr. W. G. Poole has been appointed acting manager.

U.S. Aluminium Production Again Reduced

Continued strikes reduced the output of primary aluminium in the U.S.A. in November by 22 per cent from the preceding month. The total of 85,865 short tons was the lowest average daily rate of production since July, 1946. Stocks were reduced by 6869 to 89,738 short tons. Prices of primary pig and ingot remained unchanged.

Nearly 100 m. Tons of U.S. Steel

United States steel capacity now approaches 100 million short tons a year, the American Iron and Steel Institution reports. The new record level is 99,392,800 tons of ingots and steel for castings, about 11 million tons more than the combined world output last year. American steel companies will spend some $468,000,000 on expansion and modernisation.

Large New Magnetite Deposits

A report by Dr. Renato Zoppis de Sena, geologist to the Ministry of National Economy in Ciudad Trujilli, confirms the existence in the Duarte Province of the Dominican Republic of extensive deposits of magnetite capable of producing 1 million tons of high grade iron ore annually "for many generations." The ore is reported to contain an average of 68 per cent of metallic iron and is accessible.

Austrian Oil Refinery Project

A report to hand from Austria states that the financial group which has for some time been planning to erect a modern cracking plant in the dock-area of Linz on the Danube, has just formed a company (the full title of which is not yet available) with an initial capital of 15 million Austrian shillings. In co-operation with the Austrian Nitrogen Works, of Linz, the new concern plans to manufacture high grade lubricating oils, diesel oil (both of which are in short supply in Austria) and several derivatives used for the manufacture of pharmaceutical products, etc. Machinery and equipment is to be transferred from the underground refinery at Ebensee, which was built during the war. The new plant will treat Middle Eastern crude imported via Trieste.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

J. H. & A. Cole, Ltd., Bristol, fertiliser manufacturers, etc. (M., 4/3/50.) February 2, mortgage and charge, to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on land and buildings in Feeder Road, and in or near Feeder Road, St. Philips, Bristol, with machinery, fixtures, etc., also a general charge.

Satisfaction

Black, Taylor & Cowell, Ltd., Farnworth, soap manufacturers, etc. (M.S., 4/3/50.) Satisfaction February 7, of mortgage registered June 20, 1947.

Company News

Ilford, Ltd.

The net profit for the year ended October 31, 1949, was £312,388. The directors recommend payment of a dividend of 25 per cent, less tax, on the ordinary share capital. £121,391 is to be carried forward. A further £150,000 (after provision for taxation) has been placed to a replacement reserve.

New Registrations

Institiud Ceimice na Eireann (The Institute of Chemistry of Ireland)

Company limited by guarantee, without share capital (13,183). Registered in Dublin, January 28. To promote the advancement and knowledge of chemistry in all its branches. Subscribers: D. Crowley, University College, Dublin; W. Cocker, Professor of Chemistry; Thomas Dillon, Professor of Chemistry, University College, Galway; V. C. Barry (Medical Research Council of Ireland); D. Hurley; and six others.

Process and Chemical Engineering Co., Ltd.

Private company. (478,545). Capital £500. Manufacturers of chemical and process plant, etc. Directors: S. P. Bennett, and J. G. Irving.

Increases of Capital

The following increases in registered capital have been announced:—East Anglia Chemical Co., Ltd., from £2200 to £10,000; Hills & Sons, Ltd., from £10,000 to £58,000; William Briggs & Sons, Ltd., from £300,000 to £500,000; Ferramic Industries, Ltd., from £20,000 to £60,000; Hickson & Welch, Ltd., from £110,000 to £200,000; James Robinson & Co., Ltd., from £42,000 to £100,000; Dutton & Reinisch, Ltd., from £100 to £5000.

Changes of Name

The following changes in name have been announced:—M. L. Alkan, Ltd., to M. L. Alkan (Sales), Ltd.; Courtin & Warner, Ltd., to Warner's Technical Services, Ltd.; Premier Blue Co., Ltd., to Isopol Chemical Co., Ltd.

Explosion Hazard Reduced

THE risk of explosion of mineral gas, an instance of which was cited in a news paragraph last week (The Chemical Age, 62, 307), is stated to have been greatly reduced at a Belgian colliery.

This has been achieved at La Bouverie Colliery, near Mons, which pumps off the firedamp gas and sells it to the local gasworks, reports a correspondent of the *Financial Times*.

The gas tapped from the pockets has been found to be twice as rich in thermal content as ordinary town gas. When neighbouring pits are treated in the same way the company's gas production is expected to approach 1 mil. cu. ft. a day.

Healthier conditions in the galleries are claimed to be produced by reducing the draught set up by the artificial air flow created to expel the firedamp. Less dust is raised. It should, therefore, be possible to increase the labour force and the tonnage of coal raised.

The Stock and Chemical Markets

STOCK markets have been perplexed by the outcome of the General Election. It is clear that the Government has no mandate to carry on with its nationalisation plans. Because of this, it is not surprising that insurance, cement, sugar, and chemical shares have turned firmer this week.

An exception has been iron and steels, although it is clear that there can at present be no question of carrying through steel nationalisation. Sharp falls in iron and steel shares earlier in the week tended to bring in buyers later, because, in most cases, yields are attractive and prospects of maintaining dividends considered good.

Chemical and kindred shares have naturally moved quite closely with the general trend of markets. The latter fell sharply on Friday of last week when first election results indicated the possibility of a good Labour majority, but later recovered when final results greatly reduced the Labour lead.

On Friday last week, Imperial Chemical were down to 41s., but have since rallied to 42s. 6d. Monsanto have been steady at 51s. 3d. Fisons, at 23s. 3d., have been fairly steady, despite the company's big new capital plans, issue terms of which are expected to be announced officially before long. Albright & Wilson have remained at 28s. 9d., Brotherton were 19s. 3d., and Boake Roberts 5s. shares 25s. 6d. Amber Chemical 2s. shares were dealt in at 4s. 9d., and F. W. Berk 2s. 6d. shares were 18s. 9d. Bowman Chemical 4s. shares were 5s. 3d., Pest Control 5s. shares 8s., and L. B. Holliday 4½ per cent preference were around 19s. 9d.

Turner & Newall, at 79s., regained most of an earlier heavy fall, while United Molasses rallied to 39s., Lever & Unilever to 41s. 9d., and British Aluminium were good at 41s. Borax Consolidated deferred at 54s. turned firmer, and British Oxygen at 93s. 9d. regained most of an earlier small decline, the market expecting the past year's results (with the dividend maintained, and probably an issue of additional shares to be made to shareholders on attractive terms) to be well received.

The view that conditions in the plastics industry are beginning to improve helped British Xylonite (58s. 9d.), and British Industrial Plastics 2s. shares were active around 5s.; De La Rue rallied 1s. 9d. to 23s. Although best levels were not held, British Glues 4s. shares remained active and were 20s. at the time of writing. Triplex Glass remained active, but eased to 19s. 6d. The 4s. units of the Distillers Co. receded to 17s., but later firmed up to 17s. 3d.

Among iron and steels, United Steel fell back to 26s. 9d., and most of the other leaders were lower because of the continued uncertainty of nationalisation.

Boots Drug were 48s. 6d., and Glaxo Laboratories failed to hold best levels, but were better on balance at 45s.

Market Reports

THERE is little change in conditions on the industrial chemicals market, the indecisive result of the General Election not having any particular influence. The volume of export trade continues to be maintained and price changes of importance have been reported. The soda products generally continue in steady demand, with an active request reported for caustic soda, soda ash and chlorate of soda. The potash chemicals remain firm and a fair amount of new inquiry for most items is apparent. Bleaching powder, formaldehyde, hydrogen peroxide and borax are all in good call, while the non-ferrous metal compounds are receiving fair attention at unchanged rates. Most items in the coal tar products market are moving well and prices remain unchanged.

MANCHESTER.—From the point of view of actual deliveries for consumption by the home market, Manchester chemical traders have had a satisfactory week. The cotton and woollen textile trades in Lancashire and the West Riding are calling for steady deliveries and there is a good aggregate movement of supplies to the other leading industrial outlets. Both inquiry and actual new business during the past week have been on a fair scale. Among the fertiliser materials there is an improving demand for superphosphates and sulphate of ammonia. Most sections of the tar products market are experiencing a fair demand.

GLASGOW.—There is little to report from the Scottish chemical market apart from the general slackening of orders, which appears to have been due to the Election. It is anticipated, however, that the orders will be placed next week, and that the turnover will be up to the usual standard.

CANADA'S CHEMICALS

Continued Expansion Expected

CHEMICAL prospects in Canada for 1950 appear excellent, reports the Toronto Purchasing Agents' Association. Large tonnage of chemicals is being contracted for and the supply position in Canada is much more favourable than it was a year ago. Some decrease in the price of British and European chemicals is anticipated and it is noted that they are being made available in greater quantities than before the war.

Alcohols remain firm in price and the supply is good. Liquid caustic soda is in excellent supply, but chlorine tightened somewhat during the latter part of January. Sodium silica fluoride prices have lowered, with the British and European suppliers competing for tonnage orders. The price of this material in carloads has been reduced about 4 cents per lb. The Steel Co. of Canada, Ltd., Hamilton, has announced that with effect from February 1 their tank car prices and drum lots on benzol were advanced by 2½ cents per Imperial gallon. Coal tar chemicals such as toluol, xylol are not so free as their petroleum derived equivalents.

1948 Production Reviewed

Production by factories in Canada which were engaged principally in the manufacture of fertilisers was valued at $68,986,000 in 1948, compared with $58,784,000 in 1947, the Bureau of Statistics reports. In addition there was a production of 236,000 tons of cyanamid, ammonium sulphate, mixed fertilisers and fish fertilisers valued at $10,068,000 in 1948 and 234,181 tons at $8,028,000 in 1947, by establishments which were classified to other industrial groups. The quantity of fish used as fertiliser in 1948 amounted to 57,248 barrels valued at $62,485.

Thirty-three plants were occupied chiefly in manufacture of fertilisers in 1948. Total production of mixed fertilisers in 1948 from all industries amounted to 650,228 tons worth $22,738,000 at factory prices and included 641,056 tons ($22,220,000) made by plants in the fertiliser manufacturing industry and 9172 tons ($518,204) made in the meat packing, oils and fats and the adhesive industries.

Ammonium sulphate was made by Consolidated Mining & Smelting, Ltd., at Trail, and also by a number of coke manufacturers. Production during 1948 amounted to 215,109 tons.

ISRAELI POTASH

National Control to Predominate?

THE finance committee of the Israeli Parliament is reported to be considering a proposal that the Palestine Potash Co., Ltd., should be changed from British to Israeli ownership. A ministerial committee recommended that the Government of Israel should take a $2.5 million interest in the company, that the board should be reconstituted to have a majority of Jewish members, and that the company's registration be transferred from London to Israel.

This would appear to conflict with a statement by the Israeli Government, denying nationalisation intentions and advising the Palestine Potash Company to participate with financially powerful groups for the fuller exploitation of the Dead Sea's minerals (THE CHEMICAL AGE, *61*, 310).

The question of raising capital for the resumption of work must await the outcome of the Israeli Government's discussions, said an official of the company in London last week. At the company's works at the northern end of the Dead Sea it has been observed that, although plant had not been destroyed, some of the heavier units had been moved to Jordan.

Ceylon Will Export More Soap

CEYLON is expected shortly to increase her exports of soap, especially to India and Pakistan. The present export of soap from the Island amounts to about 200 tons a year. It is proposed to increase this amount to about 500 tons a year.

The local soap industry is at present made up of five large concerns and about 100 units organised on a cottage industry basis, the latter being of diminishing importance. Total capacity is about 20,000 tons a year.

Mr. A. Ratnayake, Minister of Cooperative Undertakings, recently opened a new soap factory installed in Colombo by the Eastern Chemical Industries, Ltd., which has installed the latest machinery for the manufacture of high-class soap. Soap imports, except of some medicated types, are banned in Ceylon.

Norwegian Superphosphates Factory

The new superphosphate factory of the Norske Zink Kompanie, at Odda, Norway, has started production with a provisional capacity of 40,000 tons annually. It is hoped to increase this to 80,000 tons.

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Next Week's Events

MONDAY, MARCH 6

The Chemical Society

Galway: University College, 7.45 p.m. (With ICA, RIC and SCI). Prof. M. Stacey: "Deoxy-sugars and Nucleic Acids."

Society of Chemical Industry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. Dr. S. T. Henderson: "Recent Developments in Fluorescent Materials."

TUESDAY, MARCH 7

The Institute of Fuel

London: Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. A. E. Margolis: "District Heating in the New Towns."

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, Great Charles Street. G. H. Hands: "Experiences in Bright Nickel Plating."

Incorporated Plant Engineers

Cardiff: Grand Hotel, Westgate Street, 7.30 p.m. J. Barrington Stiles: "Metallising for Industrial Plant Maintenance."

WEDNESDAY, MARCH 8

Royal Society of Arts

London: John Adam Street, W.C.2, 2.30 p.m. Prof. M. L. Oliphant: "The Industrial Applications of Atomic Energy."

Association of Scientific Libraries and Information Bureaux

London: Institution of Electrical Engineers, Savoy Place, W.C.2, 5.30 p.m. F. C. Francis: "The British National Bibliography."

Society of Chemical Industry

London: 11 Chandos Street, Cavendish Square, W.1, 6 p.m. Microbiological panel A.G.M. 6.15 p.m. Dr. G. Pontecorvo: "The Impact of Genetics on Microbiology."

THURSDAY, MARCH 9

The Chemical Society

Aberdeen: Marischal College, 7.30 p.m. Prof. H. B. Nisbet: "The Chemistry of Anæsthetics."

Nottingham: University, 6.30 p.m. Prof. W. Wardlaw: "Some Aspects of Structural Chemistry."

Manchester: University, 6.30 p.m. Prof. J. W. Cook: "Polycyclic Aromatic Hydrocarbons."

Society of Chemical Industry

Nottingham: Technical College, 7.15 p.m. E. Morgan: "High Duty Irons."

The Royal Society

London: Burlington House, Piccadilly, W.1, 10 a.m. Discussion: "Bond Energies and Bond Lengths."

Royal Society of Arts

London: John Adam Street, W.C.2, 5.15 p.m. E. V. Parkinson: "The Growth of the Steel Industry in India."

The Pharmaceutical Society of Great Britain

London: 17 Bloomsbury Square, W.C.1, 7.30 p.m. Dr. J. O. Irwin: "Statistics and Biological Assay."

FRIDAY, MARCH 10

The Chemical Society

Glasgow: University, 7-15 p.m. Dr. A. H. Cook: "Purine Synthesis—A New Chapter."

Belfast: Agricultural Lecture Theatre, Elmwood Avenue, 7.30 p.m. R. A. Wells: "Inorganic Chromatography."

Society of Chemical Industry

Ipswich: Public library, 7.30 p.m. F. Armitage: "Recent Developments in the Surface Coating Industry."

Institution of Works Managers

Manchester: Engineers' Club, 6.30 p.m. P. H. Briggs: "The Application of Electronics in Industry."

Oil and Colour Chemists' Association

Manchester: Engineers' Club, 6.30 p.m. G. A. Campbell: "Dispersion and Wetting in Non-Aqueous Media."

The Institute of Metals

Birmingham: Chamber of Commerce, New Street. Symposium: "The Investigation of Alloy Systems."

SATURDAY, MARCH 11

Society of Leather Trades Chemists

Manchester: Engineers' Club, 2 p.m. J. N. Blake: "The Use of Hide Trimmings by the Gelatine Manufacturer."

SCI Summer Tour

A visit to Norway is planned for this year's summer tour of the Food Group of the Society of Chemical Industry, in the first week in June. Arrangements are being made for visits to factories and other establishments of interest in the Oslo and Bergen districts.

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Disintegrators for the treatment of solid-bearing liquids.—Sulzer Frères Soc. Anon. June 4 1947. 634,585.

Manufacture of styrene compounds.—Distillers Co., Ltd., F. E. Salt, and W. Webster, and G. Galitzenstein. [Legal representative of E. Galitzenstein (deceased).]. June 24 1948. 634,587.

Apparatus for electrically precipitating suspended particles from gases.—American Air Filter Co., Inc. July 9 1947. 634,676.

Method of treating low-grade fatty stock to form alkyl esters therefrom.—Lever Bros. & Unilever, Ltd. July 15 1947. 634,411.

Process for the manufacture of dihalides of aliphatic mono-olefins.—N.V. De Bataafsche Petroleum Maatschappij, and R. S. Airs. July 18 1947. 634,414.

Production of synthetic resins.—J. W. Fisher, and E. W. Wheatley. July 22 1947. 634,591.

Method of coagulating dispersions.—B. F. Goodrich Co. July 25 1947. 634,680.

Process for the preparation of agar-agar.—T. S. Lian. July 31 1947. 634,596.

Process for the recovery of hydrocarbons from a sludge.—Universal Oil Products Co. Aug. 6 1947. 634,597.

Process for the production of synthetic drying oils.—Universal Oil Products Co. August 6 1947. 634,598.

Process for improving the tensile strength of polymeric materials.—E. I. Du Pont de Nemours & Co. April 15 1947. 634,600.

Pyrimidine derivatives.—I.C.I., Ltd., A. D. Ainley, F. H. S. Curd, and D. N. Richardson. Aug. 9 1948. 634,471.

Quinoline derivatives.—I.C.I., Ltd., and F. H. S. Curd. Aug. 9 1948. 634,531.

Catalytic isomerisation of solid hydrocarbons.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 22 1947. 634.602.

Process for the synthesis of hydrocarbons.—Standard Oil Development Co. Sept. 11 1947. 634,584.

Process for the preparation of reaction products of natural and synthetic rubbers with sulphur dioxide.—Rubber-Stichting. Oct. 23 1947. 634,586.

Production of poly-esters.—J. G. N. Drewitt, and J. Lincoln. Oct. 27 1947. 634.609.

Chemical treatment of sand for glassmaking.—Standard Brick & Sand Co., Ltd., and H. D. Segrove. Nov. 16 1948. 634,479.

Adhesives for nylon.—I.C.I., Ltd. Dec. 19 1947. 634,422.

Production of luminescent calcium tungstate.—British Thomson-Houston Co., Ltd. Feb. 14 1949. 634,616.

Manufacture of amino-aldehyde adhesives.—I. F. Laucks, Inc. April 3 1946. 634,777.

Process for polymerising unsaturated compounds in the emulsified state.—N.V. De Bataafsche Petroleum Maatschappij. Feb. 20 1947. 634,789.

Method for the production of industrial mixtures of carbon monoxide and hydrogen.—Standard Oil Development Co. April 21 1947. 634,933.

Vinyl resin compositions.—Carbide & Carbon Chemicals Corporation. April 30 1947. 635,011.

Process for the production of halogenated hydrocarbons.—N.V. De Bataafsche Petroleum Maatschappij. May 12 1947. 635,013.

Manufacture of insecticidal preparations.—Murphy Chemical Co., Ltd., and V. H. Chambers. May 14 1947. 634,934.

Methods of and plant for producing magnesium powder or powder metal mixtures containing magnesium.—American Electro Metal Corporation. June 4 1947. 634,799.

Process for the reconcentration of spent mineral acids.—Standard Oil Development Co. June 4 1947. 634.935.

Manufacture of trichloriminocyanuric acid.—C. H. G. Hands, F. R. Whitt, and J. W. C. Phillips. June 12 1947. 634,801.

Cellulose ether compositions.—Hercules Powder Co. July 7 1947. 634,808.

Reducing ferric oxide.—Dorr Co. Sept. 15 1944. 634.938.

Preparation of compounds of the cyclopentanodimethyl - polyhydrophenanthrene series.—Merck & Co., Inc. July 16 1947. 634,741.

Manufacture of carbonised fuel.—K. L. Storrs. July 29 1947. 634,814.

Purification of minerals.—United Glass Bottle Manufacturers, Ltd., R. Sturgeon, and E. Seddon. July 30 1948. 634,941.

Hydrocarbon synthesis.—Standard Oil Development Co. Sept. 3 1947. 634.882.

Methods for preparing barium and its alloys.—Compagnie De Produits Chimiques et Electro-Metallurgiques Alais, Froges & Camargue. Oct. 24 1947. 634,949.

Thiazolidone compounds.—Ilford, Ltd., J. D. Kendall, and G. F. Duffin. Nov. 9 1948. 634,951.

Process for preparing copper oxychloride.—N.V. Koninklijke Nederlandsche Zoutindustrie. Nov. 21 1947. 634,954.

Catalytic polymerisation of ethylene.—I.C.I., Ltd. (E. I. Du Pont de Nemours & Co.). Dec. 8 1948. 634,757.

Process for the preparation of amines having the ring system of lysergic acid or dihydrolysergic acid.—Sandoz, Ltd. Dec. 18 1947. 634,909.

Methylol pentadecyl phenol and its derivatives.—British Resin Products, Ltd., E. R. H. Jones, and I. K. M. Robson. Dec. 21 1948. 634,960.

Stabilisation of vinylidene chloride resins.—Distillers Co., Ltd., C. A. Brighton, and D. Faulkner. Jan. 11 1949. 634,762.

Manufacture of aluminium phosphate.—British Aluminium Co., Ltd., A. Coulson, and V. J. Hill. Jan. 25 1949. 634,887.

Organic silicon derivatives.—A. H. Stevens. March 23 1945. 635,194.

Production of fluorine-containing hydrocarbon derivatives.—I.C.I., Ltd., and N. F. Sarsfield. Oct. 25 1946. 635,201.

Synthetic resin compositions.—Wingfoot Corporation. March 21 1946. 635,206.

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Volume LXII 11 March 1950 Number 1600

Simplification and Productivity

THE frequent inducements to look closely at American ways in commerce and production will be uniquely increased as a result of the meetings to be held in London next week, organised by the Incorporated Sales Managers' Association. The primary objective of these is to gain an intimate picture, presented by experts, of the technique which the U.S.A. has evolved to make the fullest use of long run, low-cost production. That is the principle which probably contributes as fully as anything else to the competitiveness of American manufactured goods in world markets. Much of this is enshrined in the terms " simplification " and " standardisation." It permits the continuous maintenance of turnovers on a scale not often approached here and it cannot be satisfactorily employed without them. How that is sustained in the U.S.A. will be told in London by leading American sales managers —described by Mr. Paul Hoffman as " an extraordinarily competent group of men "—and their advice to their British counterparts on the integration of sales and production planning on a grand scale could materially improve our prospects of closing the " dollar gap."

While all the common practices of American sales management are not fit to be adopted here *en bloc,* there has grown up in the U.S.A. a custom whose wider adoption here could scarcely fail to result in important improvements in productivity. That is the liberal exchange of technical knowledge, even between apparent competitors, and occasionally the sharing of production facilities. It has to be admitted that this principle has made little headway here. The secretiveness which the Atomic Energy Research Establishment strives to preserve sometimes finds a counterpart, somewhat grotesquely, in the policy of commercial undertakings. That, one may hope, is one of the things which the London conference will serve to discourage.

Standardisation for large-scale sales programmes most obviously demands a much greater degree of collaboration among the two groups, manufacturers and users, than has yet been seen; and engineering equipment represents one of the most evidently promising fields for it. The absence of machinery for collecting and making known the technical requirements and points of view of users of engineering equipment and supplies has been underlined by the Lemon Committee. It was able, however, to point to two promising

On Other Pages

Leader:

Simplification and Productivity . 357

Notes and Comments:

After M-Aid . . 359
Forecasts of British Expansion . . 359
An Antibiotic Landmark? . . 359
Realism in Physics . . 360
Milestone in Metallurgy . . 360
I.C.I.'s U.S. Project . . 361
New U.S. Oil Policy . . 361
Status of Technology . . 362
Training Technologists . . 362
Selling to U.S.A. . . 362
Technical Literature Exhibition . . 362
The Future of Steel . . 363
February Output . . 363
Industrial Oils: New Prices . . 363
N-F Metal Statistics . . 364
Letter to the Editor . . 364
Toxic Agricultural Chemicals . . 365
The Physicist in Chemical Industry . 366
Industrial Applications of Atomic Energy . . 369
Corrosion and Erosion of Pumps . . 373
Water Sterilisation . . 374
Reconstruction in Italy . . 381
German Mineral Pigment Industry . 382
Barytes Mining in Scotland . . 383
Rust Removal: A New Treatment . 388

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

attempts by user groups to encourage standardisation of their common equipment. The sponsors were the petroleum and chemical industries. The evidence of this was the recent registration of the Engineering Equipment Users' Association, formed by five of the leading industrial groups in the chemical and petroleum industries, all of whom have some needs in common for certain engineering equipment and stores.

It is noteworthy that both the chemical and petroleum equipment industries have had direct contact with the British Standards Institution through their BSI technical committees. Thus the association starts off with an intimate knowledge of the requirements and problems of standardisation.

The new organisation will provide its members with a means of exchanging information on standardisation of the materials and equipment common to most of them. Panels of experts are being appointed to indicate where and how standardisation can be most usefully applied, and the substance of their reports will be placed before the British Standards Institution.

Although membership of this new group numbers only five, an obvious advantage in the initial stage, the plan is, of course, intended to benefit all who use the particular types of equipment. Later, it is expected, they too will be consulted. Collaboration should not be difficult to achieve; users and manufacturers both stand to benefit by standardisation and simplification, leading to a reduction of the number of types of equipment and stores and so to lower costs of production. Judged by this criterion alone, the new association appears as a timely development, which is capable of rendering good service in the current rapid expansion of the chemical and petroleum industries.

It will be strange, however, if the association does not ultimately look beyond the sphere of standardisation. The opportunities for the exchange of other vital forms of information, such as experience gained in the current creation of large production units obviously provides, should be too profitable to be neglected. In the light of the Lemon Committee's report, it is probably true, however, that the lead which the Engineering Equipment Users' Association has given to others who still have no means of presenting their co-ordinated views on standardisation may be its most far-reaching result.

Notes and Comments

After M-Aid

WHEN the attempt to forecast the shape of industrial affairs in Western Europe, and Great Britain in particular, after Marshall Aid has ended next year tends to magnify the inevitable sense of uncertainty, an effective antidote is to stand back and take a remoter view—from the standpoint of American industry. An exceptional opportunity of becoming acquainted with a stimulating view of Western Europe's chances in the field of industrial chemicals is offered in the course of the 27th annual review by *Chemical Engineering* (57, 128-130) of the state of American chemical industries. Even making allowance for the fact that this responsible American journal is at pains not to paint too rosy a picture of the future of American chemicals in world markets, it is apparent that the success of the numerous enterprises to broaden the basis of chemical production here is not doubted in the U.S.A. Chemical industries there are being warned to expect not merely curtailment of a substantial part of their accustomed sales to the new producing countries, but competition in the "neutral" markets and even at home.

Forecasts of British Expansion

THE expert American opinion, based largely upon the summaries and estimates of the Chemical Products Committee of OEEC, singles out the re-invigorated fertilisers, plastics and dyestuffs industries as potentially formidable competitors. The United Kingdom, according to this, is cast for a dominating rôle in relation to plastics and dyestuffs supplies in 1952-53. In that year British production of platics raw materials is expected to make available 45,000 metric tons of phenolics (27,700 in 1947), the same quantity of amino resins and 33,500 metric tons of vinyl resins (compared with 6500 in 1947). The figures are substantially larger than the forecasts for any other European countries which the report surveys. Expected production of other types of British plastics material in 1952, 52,500 metric tons, is almost twice as large as any other country's, the probable runner up being France (29,400 metric tons). American industry is told to expect British dyestuffs in the same year to reach a possible total of 52,000 metric tons (34,000 in 1947) and to provide 20,000 metric tons for export. "It is reasonable to assume," concludes the *Chemical Engineering* report, "that the United States will lose a substantial portion of its chemical export markets and, with the continued reduction in tariff barriers, may even face competition in its domestic markets." These figures, while no more than estimates, can scarcely fail to have a bearing on such things as U.S. tariff policy and the ECA programme. The report, however, disclaims responsibility for drawing any such conclusions.

An Antibiotic Landmark ?

CHEMISTS with an appreciation of the historical aspects of their subject might now jot down in their diaries "subtilin, 1950." With very little publicity, antibiotics have entered a new field. Penicillin, streptomycin, aureomycin, chloromycetin, and bacitracin have all helped the doctors; subtilin is a new antibiotic substance that promises to help food processors by destroying food-decaying bacteria. The submerged culture technique can be used in producing subtilin, which is derived from *Bacillus subtilis*, a strain of bacteria of fairly wide occurrence in nature. At the moment, subtilin's possibilities have been demonstrated only on a research laboratory scale by workers at the Western Regional Research Laboratory, Albany, California. Long-term tests must be undertaken before any commercial use of subtilin as a preservative can safely be permitted, but there are encouraging indications in the facts that additions of subtilin to the diet of rats during several months produced no harmful consequences, and even a large dose appeared to have no ill effects on a rabbit. The preservative action is not complete. Tests with canned vegetable foodstuffs have shown that minute additions of subtilin reduce the time period and temperature required for effective canning. For peas, corn and asparagus a pasteurisation at 212° F. for periods from 5 to 20 minutes could replace the customary 30 minute or longer treatment at 240° F. While some pasteurisation seems still required to destroy the heat-sensitive decay organisms of foodstuffs, the addition of subtilin may well be sufficient to deal with the more troublesome heat-resistant spore-forming organisms. From one to five parts per million of subtilin will exercise complete inhibition of those decay organisms for which it is specifically antibacterial. The economic prospects are obviously attractive.

Realism in Physics

THAT physicists are likely to be very practical people, even when they have been immersed in the rarefied atmosphere which surrounds nuclear fission, received new evidence in the lucid and down-to-earth submission to the Royal Society of Arts by Professor M. Oliphant of current achievement and nearer possibilities of atomic fisson (pp.*369-372, this issue*). Further proof that physicists are coming increasingly to grips with problems especially in instrumentation, upon whose solution a good deal of industrial chemical expansion depends has been given in cordial terms by Dr. N. P. Inglis to physicists visiting the Billingham centre of I.C.I., Ltd. Birmingham University's professor of physics is stimulatingly explicit when dealing with the nebulous subject of atomic energy and its most likely sources and has the uncommon gift of reducing some abstractions to common terms. He is explicit about two points which recent statements have not greatly clarified. He says: "I would emphasise that industrial atomic power from uranium is on the doostep and will almost certainly be used successfully, while power from hydrogen is only a remote possibility in the light of existing knowledge." He is in no doubt that the initiative in deciding whether atomic power shall fulfill its promise or be perverted to destroy civilisation has passed to mankind at large, with some deeply sorrowful results for responsible scientists. "There is danger in all knowledge of nature. Scientific information can always yield guns as well as butter," he says.

Milestone in Metallurgy

METALLURGISTS in many parts of the world, particularly Great Britain and France, next month will be celebrating the anniversary of the birth 100 years ago of one whose inquiring spirit created entirely new prospects for the iron and steel industry. This was the young police court clerk, Sidney Gilchrist Thomas, who, working in his spare time, solved the metallurgical problem of the dephosphorisation of pig iron, which made possible the use of deposits of phosphoric iron ore previously thought to be useless. Thomas, son of an Inland Revenue officer, was born in London on April 16, 1850. The death of his father when Thomas was seventeen caused him to abandon his hope of a professional career, and thrust upon him the rôle of recorder, first at Marlborough Street, then at the Thames Police Court. He found sufficient time to take up the study of chemistry and physics, and it was the observation of a lecturer at Birkbeck College which first turned his attention to the pig iron problem. The centenary will be officially commemorated by the Iron and Steel Institute on April 26, when no doubt the story will be told of his association with his cousin, Percy Carlisle Gilchrist, and others who helped to develop the process, the success of which lay to a large extent in lining the melting furnaces with the mineral dolomite. No country benefited more from Thomas's work than France, where he died—in Paris, at the early age of 34.

I.C.I.'s U.S. PROJECT

Bid for Control of Rhode Island Co.

IMPERIAL Chemical Industries, Ltd., has made an offer to acquire a controlling interest in Arnold, Hoffman & Co., Inc., chemical manufacturers, of Providence, Rhode Island, U.S.A. If the offer is accepted, I.C.I. will acquire an interest in the manufacture of dyestuffs and other synthetic chemical products in the United States and a medium through which its dyestuffs and auxiliary products, made in the U.K., can be readily marketed in the U.S.A.

Arnold, Hoffman & Co. Inc., has an issued capital of $930,000 consisting of 93,000 common shares at a par value of $10, the price offered by I.C.I. being $55 per share. The American Corporation operates three plants—at Charlotte (North Carolina), Cincinnati (Ohio), and Dighton (Massachusetts), and is engaged in the manufacture of a variety of chemical products including dyestuffs, plasticisers, printing gums, sulphonated oils, synthetic resins and wetting agents.

The finance required, says an I.C.I. statement this week, will be provided by bank loans in New York, and the transaction will not, therefore, involve the use of any of Britain's dollar resources. The transaction, which has been approved by the United Kingdom Exchange Control authorities, is expected to result in a substantial increase in the flow of dollar earnings to Great Britain.

Comment from independent sources foresees that the transaction may involve an investment of $3.5 million. I.C.I. would probably require an interest if not much less than 70 per cent of the issued capital of the American company.

The latter is one of the oldest industrial chemical undertakings in the U.S.A., having been established in 1815 and incorporated in 1900. Its sales in 1948 produced over $7 million and there was a net profit of $218,584. The year before, the company obtained, as a loan, $600,000 which is being repaid in equal instalments over a period of 12 years.

Mr. Stanley Chambers and Mr. J. L. S. Steel are reported to be the I.C.I. directors largely responsible for the company's negotiations to obtain control of Arnold, Hoffman & Co., Inc. Mr. Chambers, who recently joined the board, was previously chief of the Finance Division of the Control Commission in Germany.

NEW U.S. OIL POLICY

No More ECA Aid for Refineries

A REFUSAL to finance further British overseas expansion of oil refining industry was disclosed in the text of a report on crude oil and petroleum products and equipment under ERP, given this week by Mr. Paul Hoffman, administrator of the ECA, and Dr. Oscar Bransky, chief of the petroleum branch, ECA, to a U.S. Congress sub-committee on petroleum.

Referring to British claims for the need to expand oil production, Dr. Bransky said the British had always insisted that their expansion programme was not excessive and was designed to meet only their commercial market needs.

Oil interests in Britain had maintained that the use of current surpluses to displace American oil from the sterling area, Argentina, Sweden, Norway, Denmark, Finland, Spain and Portugal, was only temporary.

ECA refused, however, to finance any of this overseas expansion—some $80 million (£28,571,000) had been requested in the fiscal year 1949—pending better information on the overall expansion programme.

The ECA was withholding the further financing of British company projects anywhere, until the outcome of the talks in which the State Department were also taking part.

Approval of aid was not to be withdrawn, Dr. Bransky said, for the two refineries in the United Kingdom financed by ECA, or for the two on the Continent in which British companies had an interest.

ECA estimated that in 1951 European countries would spend about $700 million on crude oil, refined products and equipment, representing about 28 per cent of their $3100 million deficit.

Electronic Torch Melts Tungsten

A NEW electronic torch capable of melting firebrick and even tungsten (at 3370° C.) has been developed by Dr. J. D. Cobine, at the (U.S.) General Electric research laboratory, Schenectady, New York. No method has as yet been devised for measuring the temperature of the flame, produced by passing nitrogen through an arc of extremely high frequency radio waves. The waves break up nitrogen molecules into individual atoms. When these reunite heat is released. No industrial uses have yet been indicated.

STATUS OF TECHNOLOGY

Segregation Would be Illogical

THAT pure and applied science must be stable companions in any well-designed technical curriculum, was the view expressed by Sir James Peck, former Permanent Secretary of the Scottish Education Department in his address to the annual meeting last week of the Former Students' Association of the Royal Technical College, Glasgow.

He said that the dividing line between pure and applied science must at times be a little vague and there must always be a spill-over. Nevertheless, a broad distinction did exist between knowledge for its own sake, and the application of knowledge to the needs of man.

"I would not put technology in the position of the poor relation, or the servant to these high-browed masters," said Sir James. "Rather I would claim that both are activities of the ingenious mind of man equal in prestige though different in kind.

One suggestion, said Sir James, was to let the colleges take over the whole business and become technical institutes of university rank, self-contained and self-sufficient.

But what did that lead to in logic? Were the other faculties to follow suit, and so provide one university for arts, another for medicine, one for law, and so on?

That would no doubt result in greater manageability and a narrow specialised efficiency, but what would become of the old idea of a university serving its region in all subjects of repute?

Training Technologists

THE establishment of three new post-graduate schools in applied mechanics, physical metallurgy and mining, at Sheffield University was announced last week.

Cost of the scheme, which it is hoped will ensure a steady flow of fully trained technologists to industry, will be about £20,000 a year, and the first students are expected to be enrolled in October.

Practical experience in a works where he could apply his learning was essential for the university man to become a fully trained technologist, said Dr. A. W. Chapman, registrar of Sheffield University. What had become appreciated only recently was that, after a few years in industry, a man could benefit greatly from a further study of the most advanced aspects of his particular technology.

SELLING TO U.S.A.

Sales Planning and Management

"SALES Planning for Dollar Markets" is the subject of an Anglo-American conference, organised by the Incorporated Sales Managers' Association and the (U.S.) National Sales Executives, to be held in London on March 13 and 14.

The first task of the conference, which will be attended by a team of American sales managers, is to give their British counterparts a working knowledge of American sales practices. A comparison of American methods, in which the emphasis is on volume sales, can then be made with British methods which are, generally, more selective. The Americans hope to be able to suggest ways of making British industries more price competitive by world standards to provide a freer flow of exports to all countries.

The U.S. team includes Mr. R. A. Whitney, president, National Sales Executive and Mr. D. Mitchell, president, Sylvania Electric Products, Inc.

Technical Literature Exhibition

TO have attained an international reputation as one of the principal scientific journals in a brief eight years is a unique achievement.

This is the success of *Endeavour*, the quarterly review published by I.C.I. in English, French, German, Italian and Spanish, of which 30,000 copies of each issue are distributed free to specialists.

An exhibition devoted to this magazine and the many other forms of technical literature produced by I.C.I. is now on view in the exhibition hall of the Academy Cinema, Oxford Street, London, W.1, until March 17. Every year some 800 new books and brochures are published, ranging from four-page leaflets to standard reference works of several hundred pages. Examples of these, produced by various divisions of the company, are attractively displayed.

International Microchemistry

THE first International Microchemical Congress, to be held in Graz, Austria, from July 2-5, under the auspices of the Austrian Society for Microchemistry, is to include celebrations of the anniversaries of the death of Emich and Pregl, who pioneered the development of microchemical techniques in Graz. Lectures will cover the whole field of microchemistry.

The congress secretary is H. Malissa, Schögelgasse 9, Graz.

THE FUTURE OF STEEL

The Government's Intentions

THE first challenge to the Government's nationalisation policy since Parliament reassembled was issued by Mr. Anthony Eden in. the House of Commons when he spoke for the Opposition following the Address on the King's speech.

There could be no argument, said Mr. Eden, that there had been a pretty emphatic vote in the election against nationalisation. The country wanted no more nationalisation, no more socialisation, and no more mutualisation—a singularly ugly word which ill concealed its ugly purpose.

In the view of the Opposition, that went for iron and steel also. He trusted that the Government had accepted that verdict in the same way as they had accepted the verdict to shelve all other nationalisation measures.

The Prime Minister, Mr. Clement Attlee, stating the case for the Government, said that it had been stated quite clearly in the gracious Speech that where it was necessary to introduce measures, even though they were contentious, the Government would not hesitate to do so.

" I was asked a question on the position of the Iron and Steel Act," continued the Prime Minister. " That Act is on the Statute Book. The corporation cannot be appointed until October 1, 1950. The earliest date for vesting is January 1, 1951.

" There is nothing to be done in the matter immediately, but that statute is on the Statute Book and our purpose is to give effect to Acts passed by Parliament."

An amendment to the Address. bringing the issue into the scheme of debate was promptly tabled in the names of Mr. Winston Churchill, Mr. Oliver Lyttelton, Mr. Harold Macmillan and Mr. R. A. Butler. It read:

"...But humbly regret that the gracious Speech contains no reference to the future of the iron and steel industry and that in a time of rising world competition this vital industry will be kept in a state of anxiety and suspense."

The subject was raised in firmer terms in the House on Tuesday when Mr. Churchill said the Opposition would be willing not to press the matter to a division if the Government would give a declaration that the vesting date should be not less than nine months after the next general election.

Mr. Herbert Morrison, replying, said that if the vote came, the Government would be ready to meet it. He described as " quaint " the idea that nothing should be done about steel nationalisation until another general election in order that the industry should be left in security and certainty. He considered it would have the reverse effect.

(continued at foot of next column)

FEBRUARY OUTPUT

All Steel Records Broken

STEEL production in Britain in February again reached a new record, output for the month being equivalent to an annual rate of 16,898,000 tons.

This total exceeded by 490,000 tons the previous highest rate established in May, 1949, and was over one million tons greater than the January output.

Pig iron production was at an annual rate of 9,588,000, an increase of 166,000 tons compared with a year ago.

Detailed figures for the first two months of this year and last year were as follows:

STEEL INGOTS AND CASTINGS
(Thousands of Tons)

	1950		1949	
	Weekly average	Annual rate	Weekly average	Annual rate
January ...	305.3	15,873	288.5	15,002
February	325.0	16,898	311.1	16,176
	PIG IRON			
January	187.4	9,742	178.1	9.262
February	184.4	9,588	181.2	9,422

Production rates in Scotland and Wales also set up new records. Scottish output reached an annual production rate of 2,632,400 tons, which was 44,300 tons more than the previous best total, established in March last year.

The figure for South Wales was 3,493,000 tons, an increase of 200,000 tons over the output for February, 1949.

Industrial Oils: New Price Structure

THE Minister of Food announces that during the four-week period ending April 1 the following alterations will be effective in the prices of unrefined oils (all prices being per ton naked, *ex* works):—

Linseed oil from £126 to £132; linseed oil foots from £76 to £82; castor oil firsts from £98 to £115; castor oil seconds from £91 to £108; whale oil No. 3 grade from £99 to £85; whale oil No. 4 grade from £91 to £75; whale oil/herring acid oil from £58 to £70; whale acid oil, hardened, from £93 to £90; mixed sunflower and whale acid oil from £58 to £70.

The prices of all other unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users will remain unchanged.

PRODUCTION AND STOCKS OF N-F METALS

Generally Increased Production in January

CONSIDERABLE increase of production in all groups of non-ferrous metals was noticeable in January compared with the same period of 1949. This is shown by the monthly figures issued by the British Bureau of Non-Ferrous Metal Statistics.

While imports remained fairly steady, there was a decline in exports except in the case of tin metal. Government and consumers' stocks were better than a year ago, except those of lead.

UNWROUGHT COPPER

	Long Tons Blister Copper	Refined Copper
OPENING STOCKS		
Govt. and consumers' ...	46,796	82,878
Imports	6,602	19,308
PRODUCTION:		
Primary	—	12,682
Secondary	2,237*	5,689
CONSUMPTION:		
Primary	12,832	25,086
Secondary	—	16,887
Exports	2,637†	45
CLOSING STOCKS:		
Govt. and consumers' ...	40,402	89,798

*Rough Copper.

† Includes 431 tons of rough copper despatched to Belgium and 2206 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	24,402	long tons
Alloyed copper products	25,031	,, ,,
Copper sulphate	4,019	,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	37,026	61,570
Imports	2,654	7,199
PRODUCTION:		
Virgin and remelted ...	—	5,607
CONSUMPTION:		
Virgin (incl. debased)	6,712	10,229
Remelted and scrap	—	8,035*
Exports and Re-export	—	11
CLOSING STOCKS:		
Govt. and consumers'	32,968	54,145

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	48,875	2,524	—
Other stocks	80	—		
IMPORTS	—	21,081	—	229
PRODUCTION	214	—	5,324	—
CONSUMPTION	235	14,782	4,657	8,501
Exports	—	16	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	—	—	—
Other stocks ...	59	—	—	—

TIN METAL

	Long tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,941*
IMPORTS	50
PRODUCTION	—
CONSUMPTION	1,830
EXPORTS AND RE-EXPORTS	471

* Amended figures to represent Government's stocks wherever located.

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	443
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	336

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	59.35

LETTER TO THE EDITOR

Need for Chemical Traders

SIR,—I am instructed by my Council to refer to the "Report on the Chemical Industry, 1949," prepared by the Association of British Chemical Manufacturers at the request of the President of the Board of Trade, and to register a strong protest against the statements embodied in Chapter 13, one of which reads:—

"There is thus little room in the home market for ordinary merchant selling, and in fact merchants occupy a small place in the industry."

This statement is not only misleading and inaccurate, but is without foundation, since it is a well established fact that merchants have played, and continue to play, an important part in the development of markets for the chemical industry both at home and abroad.

It is to be deplored that my association was not consulted before statements detrimental to the British chemical trade in general, and to chemical merchants in particular, were published.—Yours, etc.,

F. G. W. PAIGE,
General Manager and Secretary,
THE BRITISH CHEMICAL & DYESTUFFS TRADERS' ASSOCIATION.

Coronation House,
4 Lloyd's Avenue, London, E.C.3.
March 2, 1950.

TOXIC AGRICULTURAL CHEMICALS

Were Essential Precautions Too Quickly Relaxed?

From A CORRESPONDENT

ONE of the outstanding advances of applied science in recent years has been the development in new insecticides and weedkillers, and the rapid expansion in their use.

In any valuation of the great benefits they have conferred—by the increase of food supplies—it is not possible to exclude the fact that some of them stand indicted as potentially dangerous poisons bringing known and unknown risks to human life. A modern agricultural merchant's store, or the barn of a progressive farm or market-garden today may carry a stock of lethal substances far beyond the dreams of the Borgias.

It may be objected that this has always been true, in some degree. Arsenicals, nicotine products, salts of mercury, and sulphuric acid have been customary materials of trade for some time. In practice, however, the poisonous or corrosive hazards of these established articles have long been well known and that knowledge has diminished the danger. The extreme example, potassium cyanide, which is also ocasionally used as an insecticidal fumigant, is the source of very few accidents.

It is impossible to make any poison child-proof, fool-proof, or incapable of being criminally misused. But new poisons carrying new risks present graver problems. It is in the interests of these chemicals and of their great benefits to food production that this aspect of their use calls for frank recognition.

Four Fatalities

Dr. Donald Hunter's Ernestine Henry Lecture to the Royal College of Physicians (*Brit. Med. Journal*, March 4, 1950) calls attention to the fact that the spraying of solutions of DNOC (3: 5-dinitro-*ortho*-cresol), now extensively used as a weedkiller, has caused the deaths of four agricultural workers in this country, and a number of other deaths in Germany, Hungary, France, the United States, India, and Africa. " Most spray operators lose weight during the DNOC spraying season . . . There is good evidence that DNOC is a cumulative poison . . . DNOC is absorbed through the skin by ingestion or by inhalation of dust, spray, or vapour . . ." These are precise statements of the toxic risks associated with spraying diluted DNOC.

Deaths have also occurred in the manufacture of DNOC, but here it may fairly be argued that it should be possible to impose and maintain effective safety measures; the risk is centred at one place and for one small community of workers, and it can be publicised and the fullest safeguards can be set up. It is clearly a different and much more difficult problem when the material reaches the various farming areas to be used by a wide variety of workers.

To quote Dr. Hunter again: " Spray operators must be warned that they are handling a dangerous substance . . . Routine medical examination of all DNOC workers should be made at weekly intervals. Men showing the early toxic symptoms—namely, excessive thirst, sweating, and loss of weight—should be suspended from work, since there is no way of telling in which individual severe intoxication and even death may result."

Little Control

Such measures can be exercised rigorously in a factory; they cannot with any certainty be enforced when small gangs of men work unsupervised in the field. A recent book on weedkillers, a well-known work newly revised, in describing DNOC and its use, made no mention of the associated toxic danger. On the contrary, a comparative safety was implied.

Another class of agricultural materials newly introduced is the organo-phosphorus group of insecticides, Parathion, TEPP, and HETP. Dr. Hunter observes that these are from three to five times as poisonous as nicotine. " All types of preparation penetrate rapidly through the skin, producing only slight irritation at the site of absorption. Exposure to as little as 0.3 g. daily has been estimated as dangerous to man."

TEPP and HETP, fortunately, hydrolyse rapidly on being mixed with water and this produces harmless substances; their safety from the point of view of crop residues is based upon this fact. Those who use these materials must, however, first handle them in their non-hydrolysed and concentrated form.

(*continued on page* 368)

THE PHYSICIST IN CHEMICAL INDUSTRY

Instrumentation at Billingham

by Dr. N. P. INGLIS *

IT was Lord Kelvin who said that if you wish to understand you must measure, and in our operations we accept this as axiomatic. Our flow, temperature, pressure analysis and other meters and instruments and the men who look after them are our technical accountants or watchdogs. They constitute the very guardians of our efficiency.

Even before the war, we felt that our use of instruments was at least somewhat above the average, but during recent years the degree of instrumentation has advanced almost spectacularly. Our chemists and engineers are much more instrument-minded and it is not unusual in a new chemical plant to find that the capital cost of the instrumentation is as high as 10 per cent of the total capital cost.

There has grown up a lack of content with the ordinary indicating instrument, which demanded that somebody should read and record it periodically. The demand is now firmly established for continuously recording instruments, not only because of their greater coverage of events and their greater freedom from the human element but also because they provide the gateway to automatic control of plant operations.

Obviously, if you have, say, a continuously recording temperature instrument it is elementary to follow up the thought that the impulse or force which actuates this continuous recording can be amplified if necessary and utilised to adjust a resistance or alter a valve whereby the temperature can be controlled.

Development of Instrumentation

While the accurate measurement and recording, and ultimately controlling of flow, temperature, and pressure are vital to us, the field of industrial instrumentation has now extended far beyond these. The continuous recording of gas and liquor analysis has been developed and you will see instruments in actual service which achieve this very thing. You will also see other instruments in course of development for the same and similar purposes.

Dr. N. P. Inglis

Having outlined very broadly the field of interest, let me tell you something of the people and organisation which we have to cultivate this field. First, we have an instrument research and development section, mainly staffed by physicists, but including one or two specialist engineers. This section is at the beck and call of our large research department, our factory officials and our engineering designers for all matters and problems associated with the development of new instruments or the radical improvement of existing instruments.

Some of the inquiries which we receive can, of course, be met by diverting the matter to one or other of our good friends in the instrument-making industry. Naturally, we avoid expending our efforts on matters which can be better dealt with by them.

There are, however, many inquiries and questions which concern special or novel instruments required for some purpose which is peculiar to ourselves. It would be unfair to divert the energies of the instrument firms towards such highly specialised and local jobs where, even in the limit, possibly only a very few instruments will be required.

Let me quote one or two special cases as examples. Three or four years ago a demand arose from our chemical research people for an instrument which would continuously record a very small rate of flow of a gas or liquid under pressure conditions of 250 to 350 atmospheres. As a result of the subsequent research work done by our instrument research section, a recording rotameter was developed for this purpose and 30 or 40 of these instruments are now in effective use in our semi-technical and small scale plants.

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* Director of the I.C.I. Metals Division, in a paper presented to members of the Physical Society during their visit to Billingham (THE CHEMICAL AGE, 62, 346).

The reliable existence of these instruments is making possible chemical research which simply could not be carried out had these instruments not been available. The instrument has applications for lower pressures and full details of the design, etc., have been published. Any instrument manufacturer can obtain a free licence, so that this development is now readily available to the whole of industry.

One other problem which came our way arises from the fact that at Billingham steam from our boiler plant is utilised for the generation of power in turbines and the steam at lower pressures is then used for a variety of purposes, including the operation of various engines and prime movers.

The boiler engineers very understandably require any condensate to be sent back to them as boiler feed water. They have found, however, that such condensate is often slightly contaminated by oil due to the purposes for which the steam has been used. They can tolerate an oil content of a few parts per million, but they wish to reject any condensate which contains more than this. They, therefore, asked for an instrument which would reliably and continuously record the number of parts per million of oil in the condensate. This presented us with a very nice little problem and the subsequent research and development was not without its headaches; but an instrument based on the measurement of fluorescence was evolved and has worked well.

Co-ordinated Layout

Our instrument design section has the prime responsibility for the design and lay-out of all instrument arrangements on the new plants which we construct or on the major modifications of existing plants. This work is not without its complexity because, in addition to ensuring that the right instruments are put in the right place, these designers are also responsible for the best and most economic arrangement of the network of piping, valves, electrical connections, etc., associated with such instrumentation.

We have progressed somewhat from the days when instruments were scattered round a plant rather like tops on a Christmas tree, and the tendency now is for centralised control rooms where the instruments and controls are grouped and the whole system is under the eye or one or two men.

I should also mention that the instrument designers are responsible also for the design in final form of instruments developed by our instrument research section. Naturally, the prototypes of these instruments may work very well indeed in the laboratory or even on the plant when under the loving care and kindly handling of a highly skilled physicist, but may require modification in order to make them more robust and foolproof. The instrument design section, which is learned in the ways of the ham-handed, plays an important part in converting the successful prototype into the Mark I instrument. An equally important part is played by an instrument workshops.

Instrument Servicing

While we are not instrument makers, it is essential that we should have a sound instrument workshops for the repair and maintenance of our instruments. The capital cost of much of our plant is so great that we cannot afford to have it idle or running inefficiently due to delays in repairing vital instruments. Our instrument workshops also make the special instruments which the instrument research and development section devise.

Last but by no means least you must all realise that it would be stupid to have a strong instrument research team and a strong instrument design team unless we had an equally strong band of people to watch over the instruments when they finally go into service. Each of our several works, therefore, has its instrument manager, who is usually a physicist. He does much more than merely maintain and calibrate the large number of instruments on his works, although this alone is quite a big task. He interprets and analyses the results which his instruments give and provides his works manager with data which determine the measured efficiency of the various steps in the processes carried out by the works. Moreover, he is continually assessing the need for additional or different instrumentation.

Aiding the Chemist

Another group of physicists studies the use of physical methods as aids in chemical research. Practically every physical technique has application in chemical research nowadays and the initial development of this application must be by physicists. They develop the application to a stage where it subsequently becomes a regular and day to day tool in the hands of the chemist. There are quite a number of examples of this class of work and I would like to say a few words about the reasons why we are so deeply interested and concerned with them.

We have done a great deal of work in the field of absorption spectroscopy and absorption spectroscopes are now much used in our analytical work for a variety of purposes. Our first major interest in such spectroscopy methods was in the analysis of special aviation fuels; such fuels were one of our major pre-occupations during the war.

By the use of infra-ray or ultra-violet absorption spectroscopes we can carry out the analysis of these highly complex materials in a matter of a few hours, whereas ordinary chemical analysis would take a very skilled analyst at least a week. In fact, this technique has been so well developed and the methods have proved so extraordinarily useful that an infra-red spectrograph is now a routine analytical tool on our petrol plant.

Use has, of course, been made of emission spectroscopes. We have very strong metallurgical interests here because of our position as a user of a very large variety of special metals and alloys. The emission spectroscope has been used to a very large extent in the analysis of such special metals and alloys.

Our X-ray crystallographic work has been found a helpful tool in much of our chemical reseach, perhaps particularly so in our fundamental work on the structures and constitution of catalysts. The sister technique of electron diffraction is also available to us for problems such as catalysis and corrosion, which involve study of the surfaces of solids.

This same section has not been slow in turning to our advantage developments in the use of radioactive elements. Potassium salts are frequent constituents in many fertilisers. By measuring the amount of the radioactive potassium isotope we have a very ready means for measuring the potassium content of such fertilisers. Such determinations are now being made in a matter of minutes by means of Geiger counters; a similar analysis would take one or two days by ordinary chemical methods. Use of radioactive elements is also being made in our study of the action of fertilisers through their life cycle.

Our latest " pride and joy " is the mass spectrometer. This is not only an analytical tool capable of analysing extraordinarily complex mixtures, but it often reduces what would otherwise be a complex and intricate research to a mere analytical exercise. A typical case of this is the work which our physicists are doing to find out how a plant, fed with a nitrogenous fertiliser, varies in nitrogen or sulphate content throughout the different stages of its growth.

This work on the application of physical methods to chemical research is one of high intellectual stimulus to the physicist and offers him an amazingly rich field of endeavour.

TOXIC AGRICULTURAL CHEMICALS

(*continued from page 365*)

It is possible to buy small bottles from horticultural sundries shops without signature and it is questionable whether the warnings given on the outer container and inside label are adequately emphatic. They include these: " This substance is poisonous. The inhalation of its vapour, mist, spray, or dust may have harmful consequences. It may also be dangerous to let it come into contact with the skin or clothing; Prolonged contact with the skin should be avoided in the case of the concentrated solution."

This product is sold at 80 per cent strength. Despite its greater toxicity, it is sold to the public with less restrictions and precautionary emphasis than nicotine sulphate (for which the Poisons Register must be signed) or nicotine dusts and sprays, which contain only low percentages of nicotine.

Parathion is more stable than HETP and TEPP. Dr. Hunter reports that one senior scientist in America " died after spraying an orchard with parathion for approximately six hours—death occurred five hours after the onset of headache. Three deaths have occurred in men handling concentrated parathion in manufacture and compounding." However, no cases of poisoning from parathion or related compounds have been reported in Great Britain.

Although such observations as these about the newer insecticides and weedkillers have serious implications, it is almost inconceivable that the use of such extremely valuable agricultural chemicals should be discontinued. It is disquieting however, to learn that the toxic properties of some of these materials are still being investigated long after they have been put into fairly wide use. Traffic lights have three colours, red, amber and green. In the practical development of these materials, should there not be an amber waiting period?

Industrial Applications of Atomic Energy

Present Limiting Factors and Some Prospects

by Professor M. L. OLIPHANT, C.B.E., M.C.[*]

THE element uranium is the heaviest and most complex of the substances existing in the earth. Elements with more than 92 protons in the nucleus are too unstable to have survived since the earth cooled down about 3000 million years ago.

When a neutron is captured by one of the two isotopes of uranium, the transformations which take place differ from these occurring in other elements. The rarer isotope of mass 235 undergoes a process which is called fission, splitting into two large fragments which separate with great velocity, the energy released being about 10 million kWh for 1 lb. of U235 undergoing fission.

The U235 atom, after absorption of a neutron, splits into two atoms of simpler structure and smaller mass, which separate with high velocity, their energy being dissipated as heat in the surrounding atoms with which they collide. In addition, several neutrons are set free, and if the surrounding material is also U235, these neutrons will be absorbed and will produce several fresh fissions.

Thus it is clear that in a mass of U235 large enough to absorb the neutrons from a fission process taking place at the centre, a chain process can build up, and since the neutrons are moving with high velocity, the number of fission processes taking place multiplies with great rapidity.

A mass of U235 in which this chain process will just take place is said to be of critical size, and the greater the extent by which the mass exceeds the critical size, the more rapid is the multiplication, so that if the critical size is exceeded appreciably an atomic explosion takes place.

Simplest Reactor

The critical mass for U235 is officially stated to be between 2 and 400 lb., and since it is a very dense substance this corresponds with a sphere of metal less than 12 in. in diameter. Since the neutrons released with high velocity in the fission process are absorbed directly, a nuclear chain reaction of this type is called a fast fission process.

Professor Oliphant

If the mass of uranium 235 consists of two pieces, either of which alone is smaller than the critical mass, and these are brought together slowly and cautiously, it is possible to find a position where the system is so little above the critical size that the energy release builds up very slowly.

The two pieces of uranium metal will then be heated and we can arrange an automatic mechanism which pulls them apart if they get too hot or brings them together if they cool off, so maintaining them in a red-hot condition. The heat given off can be transferred to water or to gas and can be converted into useful power in a heat engine. This is the simplest type of nuclear reactor which can give useful power.

Slow Neutron Reactors

The capture of neutrons by the much more plentiful U238 prevents the establishment of a chain process with natural uranium. There is, however, an ingenious way out of this difficulty, which enables reacting systems to be built using natural uranium.

U238 does not capture neutrons which are moving with less than a certain minimum velocity. Neutrons can be slowed down by passage through materials like pure carbon or heavy water, which do not absorb neutrons at all readily. The particles then make collisions with atoms of carbon or of heavy hydrogen, handing over to the struck atom at each collision a part of their energy.

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[*] Representing part of the annual Trueman Wood Lecture, which Professor Oliphant, professor of Physics, University of Birmingham, and a pioneer of the atomic energy research, presented before the Royal Society of Arts in London on March 8.

By placing rods of uranium in a geometrical pattern, which can be calculated, in a mass of pure graphite, it is possible to arrange that fission neutrons, escaping from the relatively thin rods without appreciable absorption, wander round in the graphite for a considerable time, making many collisions and losing most of their velocity. When they do again wander into a uranium rod they are, in general, moving too slowly to be absorbed by the U238, and hence ignore it. However, they are very readily captured by the rarer U235 atoms, giving rise to fission.

Tonnage Quantities

In order that a chain reaction may be produced, a slow neutron reactor of this type must also be above a certain critical size, where the number of neutrons lost from the outer surface is less than the number generated within the pile by the chain reaction. The critical size is large and even a small slow-neutron reactor will contain many tons of uranium and hundreds of thousands of tons of carbon as pure graphite.

The many neutrons escaping from the outer surface are, to some extent, reflected back by a thick layer of graphite placed round the reactor, while the remainder, together with the accompanying X-rays, which are so harmful to living matter, must be absorbed in the walls of a massive concrete enclosure.

The energy set free in the fission process in the uranium rods appears as heat, which can be removed by passing gas or water over them. Here again it is necessary to coat the uranium with a protective layer of corrosion resistant metal which does not absorb neutrons readily, aluminium being employed at present in the absence of a better material.

The slow neutron reactor has some advantages over the fast neutron reactor, but it suffers also from severe limitations which are not present in the fast reactor. The large mass and surface of the uranium allows very large quantities of heat to be extracted, so that the total power output of a large reactor can be of the order of 1 million kW of heat.

However, it is not yet practicable to remove this heat at a temperature high enough for efficient heat engines to be operated from the steam or gas which carries away the energy. This is due to the limited corrosion resistance of aluminium. The development of coatings of beryllium, or the use of less reactive gases such as helium, for cooling, would permit the production of useful power, but no reactor is yet operating under these conditions.

There are also other grave difficulties due to changes in the properties of materials under the action of the fast neutrons. These technological problems will be solved, but they take time and great effort to achieve a completely satisfactory answer.

A far more serious problem is that in a slow neutron reactor it is possible to use only a small fraction of the U235 present in the rods. Inevitable impurities in the materials, and the accumulated products of fission, "poison" the reaction by absorbing neutrons. The former set a lower limit to the concentration of U235 in the rods at which the reactor will operate, and this is only slightly less than the concentration in natural uranium.

The uranium must be removed periodically and be subjected to an elaborate and costly chemical process involving solution of the rods in acid, chemical purification and reduction to metal again.

The whole of the initial chemical operations must be carried out by remote control in concrete or lead enclosures which absorb the harmful radiations coming from the highly radioactive fission products. These fission products, equivalent in activity to many tons of radium, must be disposed of in some way, and this is one of the most difficult problems of all. The radioactivity decays away in time, some of it relatively quickly, some much more slowly, so that if the fission products are stored in vats underground they will, in the course of a generation or two, become harmless. However, the storage capacity required to deal with the radioactive waste products of a large reactor is so huge that provision of the necessary underground vats becomes an immense undertaking.

All these difficulties are very real and must not be underestimated. However, they are technological difficulties with which modern applied science is accustomed to deal, and none of them is insuperable.

"Breeder" Reactors

The picture of the production of atomic energy for industrial purposes, so far, is not encouraging. The fast neutron reactors require rather concentrated fissile material as atomic fuel and this is very difficult and expensive to produce. The slow neutron reactors utilise only a very small fraction of the rarer isotope of uranium and produce about the same quantity of plutonium. Much more than this must be achieved if atomic energy is to compete successfully with coal as a source of power.

Fortunately the way out is clear, though it has not yet been achieved in practice, and the solution brings with it the possibility of using thorium, as well as uranium, as a nuclear fuel.

On the average, a fission process releases several neutrons, say three. If it is assumed that there are in the reactor no impurities or materials of construction, other than uranium, which absorb neutrons, the three fission neutrons can be utilised in the following way.

At constant power output, one of these neutrons must produce a fresh fission by absorption into the nucleus of another fissile atom. A second neutron can be captured by uranium of mass 238 to produce an atom of plutonium, thus replacing the atom of fuel which has been used. The third neutron can be absorbed by a second U238 atom, giving another plutonium atom. Thus a reactor operating in this way should produce more nuclear fuel than is burnt and is called a "breeding" reactor.

The breeding process should make it possible to utilise the whole of the uranium, the plentiful U238 as well as the scarce U235. If the excess neutrons are absorbed in thorium instead of U238, a new fissile material which can replace U235 or plutonium, is produced, by a process very similar to that which produces plutonium. We can represent this process by the nuclear equation:

$$\mathrm{Th}^{232}_{90} + \mathrm{n}^{1}_{0} \rightarrow \mathrm{Th}^{233*}_{90} \xrightarrow{\beta-} \mathrm{Pa}^{233*}_{91} \xrightarrow{\beta-} \mathrm{U}^{233}_{92}$$

The thorium nucleus absorbs a neutron-producing a radioactive isotope of thorium of mass 233. This emits a negative electron, or β-particle, transforming into a radioactive form of proto-actinium, which emits a further β-particle to give an isotope of uranium of mass 233. U233 is a fissile substance which can be used as a fuel in a nuclear reactor. Thus, in time, it should be possible to change over from uranium to the more plentiful thorium as fuel for the production of nuclear power.

The design of a successful breeding reactor depends upon the elimination from the reactor of materials which capture an appreciable fraction of the neutrons without contributing to the production of power or of fresh fissile material. There are reasons why this may prove to be more practicable with the fast neutron reactors than with those using slow neutrons, partly because the smaller mass of fissile material in the reactor can be prepared in a state of higher purity, partly because there is no moderator, but principally because the essential materials of mechanical construction and the cooling fluid which can be used in a fast neutron reactor are not so restricted in properties.

The most important of the factors to which answers have yet to be found is the extent to which the materials in the reactor retain their physical properties of strength, etc., when the atoms of which they consist are continually stirred up and knocked out of place by collisions with fast neutrons.

Experimental Programme in U.S.A.

The Atomic Energy Commission in the U.S.A. has announced the construction of two types of experimental breeding reactor and a materials-testing reactor. The first of these is designed to test the practical feasibility of breeding with fast neutrons and to investigate the application of liquid metals to the removal of fission-produced heat at high temperatures.

The second will produce significant amounts of electric power from a reactor using neutrons in the intermediate range of energies, and at the same time will determine whether breeding is possible under these conditions.

The heat will be removed with liquid metal and power will be generated from this by conventional means. These breeder reactors, together with the materials-testing reactor, are estimated to cost about $70 million. The Ministry of Supply has not yet announced plans in Britain for work on breeder reactors upon which the future of atomic energy for useful purposes clearly depends.

Economic Cost

It is not easy to estimate, as yet, the economic cost of nuclear power. The energy derived from 1 lb. of uranium, completely utilised in a breeder reactor, is equivalent to that produced by burning 1500 tons of coal. The cost of uranium is about 1000 times the cost of coal. This leaves a factor of about 3000 to cover the cost of converting the uranium to a form suitable for use in a reactor and the greater cost of a nuclear reactor over a coal furnace. In the absence of precise data it is possible only to guess the ultimate answer.

You will find that many British scientists and engineers of repute believe that the cost will always be too great for atomic energy to compete with coal as a source of power, and that the new form of energy is purely of military and scientific interest. I do not share this view. I feel confident that atomic energy has a very important part to play in the production of industrial power and that the cost will ultimately be found to be competitive with, and probably much less than, the cost of power from other sources.

The time required to reach this stage of development is unlikely to be less than 10 to 15 years and clearly it depends on the relative efforts devoted to the military and industrial objectives. Uranium is more widespread in occurrence than was thought to be the case and, with the development of methods for extracting it from low-grade ores, there should be sufficient available to provide a great contribution to the power resources of the world if it is not used for the manufacture of military weapons.

Hydrogen as a Nuclear Fuel

Finally, we must consider the possibility that industrial power may one day be produced from hydrogen.

Long before the discovery of the fission process it was realised that under conditions of extremely high temperature and pressure, such as exist in the interior of the sun and stars, hydrogen nuclei, or protons, might combine together to give nuclei of heavier elements, and that because the component parts of heavier nuclei are very tightly bound together, sufficient energy would be released to maintain the temperature of the star.

If it were possible to find a method by which heavier atoms could be synthesised from hydrogen at will and under controlled conditions, very large amounts of energy would be available.

Thus, if four atoms of hydrogen condense to form an atom of helium the energy set free is about five million times as great as that produced when an atom of carbon is burnt. In other words, 1 lb. of hydrogen transformed into helium would produce about 100 million kWh of heat energy, or about 130 million horsepower for an hour. Thus hydrogen as nuclear fuel would be about 10 times as good, weight for weight, as uranium.

There are possible ways in which an explosive reaction of this type can be produced by utilising the very high temperature and pressures developed in the explosion of an atomic bomb, but so far there is no clue to a method for bringing about the reaction in a controllable way. However, it is interesting to speculate on the possibility that nuclear scientists may discover how to do this in the future.

There is enough hydrogen in the sea if it were all converted into helium, to raise the temperature of the whole earth to at least 1 million °C., *i.e.*, over one hundred times the temperature of the surface of the sun. Fortunately for us, the possibility of bringing about such an explosion can be ruled out, if for no other reason than that if it were possible it would have happened in the past history of the earth.

However, if we accept as the desirable power level for civilisation that every individual should utilise, on the average, 1 kW of power continuously, we can calculate that 3000 million inhabitants of the earth could be supplied with power from the hydrogen of the sea for 1000 million years, or for about a million times the age of the earth itself. Thus, if this remote possibility is realised, mankind would have no need to look elsewhere than to the sea for all the power he can conceivably use in the lifetime of the solar system.

Progress of Liverpool Cyclotron

CONSTRUCTION of the synchro-cyclotron which will form the centre-piece of the new premises for the physics department of Liverpool University is making good progress. Installation of the 1600-ton high grade steel electro-magnet has already begun, but the synchro-cyclotron, claimed to be the largest outside the United States, will not be in operation for two years.

The new machine is 156 in. in diameter, while that at Harwell, at present the most powerful in Britain, has a diameter of 110 in. The synchro-cyclotron will be operated by remote control.

Temporary laboratories are already in occupation, and it is expected that research work will begin this month when a high tension generator is installed.

Cheaper Fission Products

Resulting from extended production facilities, at Oak Ridge, Tennessee, the U.S. Atomic Energy Commission has instituted considerable cuts in the price of uranium fission products for research and industry—radioactive iodine from $1 to 75 c. per millicurie, radiostrontium and radiobarium from $1.35 to $1 and 13 others are proportionately reduced.

CORROSION AND EROSION OF PUMPS

Effects of Resistant Materials and Design

by NORMAN TETLOW, B.Sc., M.I.Mech.E.*

CORROSION is naturally a major factor for consideration when selecting constructional materials for pumps employed in the chemical industry.

The only really reliable guide where corrosion complications are known to exist is experience. Laboratory tests designed to indicate the resistance of any particular material to attack are unfortunately not always to be relied upon.

It is unlikely, for instance, that laboratory tests would indicate the suitability of cast-iron pumps for handling 60 per cent sulphuric acid at 100°F.; but these are widely used for this duty in the sulphuric acid industry; and even bronze pumps may show unexpected resistance under similar conditions.

Impurities in the acid and in the metals probably lead to the formation of protective films which are responsible for the good performance.

A very wide range of materials is nowadays available and may be used for the construction of pumps or pump linings. Some of the newer plastics seem very promising in their resistance to attack; but when linings are employed, the degrees of success achieved depends largely on the effectiveness with which the lining is bonded to the metal body, and this is frequently dependent on the individual skill of the craftsman applying the lining. This is particularly true of rubber lining.

Corrosion Factor

Stoneware or vitreous linings have been used with considerable success. Such linings are resistant to the attack of most liquid chemicals, but they are sensitive to mechanical or thermal shock, and the stuffing box problem is difficult to deal with.

To meet very extreme problems of potential corrosion, fabrication of the complete pumps in carbon or borosilicate glass has been resorted to.

The rate of corrosion is normally increased by rise of temperature; but the factor of increase is sometimes so striking as to exert a controlling influence on the conditions under which a particular material may be employed. For instance, in one series of tests the rate of attack of Hastelloy "B" by 25 per cent hydrochloric acid was increased 20 times by raising the temperature from 70°C. to 135°C.; and 37 times with 85 per cent hydrochloric acid over the same temperature range (*Metallurgia*, Vol. 40, 1949).

Other influences, such as the operating pressure or the presence of free gases, introduce additional complications impossible to assess excepting on the basis of experience.

Where resistance to corrosion depends on the formation of a protective film, the rate of attack may be multiplied enormously by attrition. The use of soft resilient rubber as a liner is frequently found advantageous on this account when abrasive matter is present.

Resistance to Attrition

The effect of attrition may be modified by the design of the pump. It is well known, for instance, that a centrifugal pump handling a chemical magma or similar product must have smooth surfaces free from interruption where in contact with the product. Any disturbance to smooth flow, however minute, may start the formation of eddy currents and lead to rapid attrition.

As an illustration of this effect, the author may cite an experience with a chemical magma pump. This pump was provided with a renewable wearing plate, of robust construction, which was secured by four countersunk head bolts of the same material as the wearing plate itself.

After fitting in the pump casing, the bolt heads were ground flush with the wearing plate, and the surface practically polished, so that the bolt heads could hardly be detected by direct observation.

After operating on the chemical magma for a period of a few weeks, the pump was examined. It was found that the minute break in continuity of surface at each of the bolt heads had been enough to start a trail of attrition, taking the form of deep grooves cut into the metal wearing plate surface.

In the search for internal surfaces free from any such disturbance, it will frequently be found that even pressure gauge, priming and drain connections may have to be omitted.

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* Abstracted from a paper delivered to the North Western Branch of the Institution of Chemical Engineers, Manchester on Saturday, February 18.

One of the most unsuitable types of centrifugal pump for this type of chemical work is the horizontally split casing design. The presence of the casing joint at right-angles to flow, can create a disturbance to smooth flow that may become the starting point for rapid combined erosion and corrosion.

In addition to the problems of corrosion and erosion to be met in the chemical industry, many other difficulties arise, often unexpectedly. For instance, the generation of static electrical charges, due to high velocity flow of liquid through a pipeline, valve or nozzle, is a far from infrequent occurrence.

Indeed, serious fires have been caused in this manner when dealing with inflammable liquids. It is particularly important to avoid any possibility of the generation of electrostatic charge when delivering an inflammable liquid to atmosphere through a nozzle.

For this reason, it may be wise to limit the pipeline and nozzle discharge velocity to 12 ft./sec., and to make provision for suitable earthing of pumps and pipelines.

The most successful centrifugal pumps for chemical work are frequently those with the simplest design features. They must be robust in design, and internal parts should be easily replaceable. Centrifugal pumps for chemical work may be either of the horizontal type, embodying a stuffing box, or of the vertical type which can be designed as glandless pumps.

The need for unchokeable pumps frequently arises in the chemical industry and on occasion such pumps may also be used from considerations of proportional effect of wear and tear.

Stoneware and vitreous linings of pumps are chemically resistant to practically all acids with the exception of hydrofluoric. They are also resistant to almost all alkaline products and have reasonably high resistance to abrasion.

A reasonably low temperature at the stuffing box, which is the weakest point in the design of all types of acid pumps, and avoidance of rapid changes in temperature, particularly at the stuffing box, are of major importance.

In the chemical industry many other pumping problems arise, quite apart from the obvious one of handling chemically active acids, alkaline products, or salt and magma solutions.

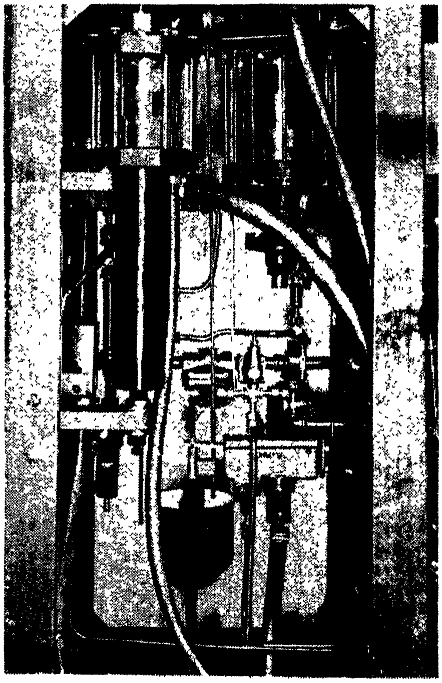
As an illustration of possibilities, a vertical glandless pump has been designed to handle molten lead at 420° C., involving severe differential problems.

WATER STERILISATION

Use of Plastics and Rare Metals

SILVER, tantalum, tungsten, platinum, iridium, columbium and, in fact, most of the noble metals, are finding increasingly numerous useful application for fabricating certain components of the water chlorinating plants. Typical of the marked advances which are being made in securing a high degree of corrosion resistance of vital components subject to continuous attack by chlorine and the mineral elements of normal water supplies are some installations being produced by Wallace & Tiernan, Ltd., London. Some of the fluorinated plastics are also being used for some vital parts, and research in this connection is continually being carried on.

The wide field in which the process of water sterilisation and bacteria control is effectively applied includes, in addition to the purification of drinking water, paper making and food canning. The chlorinator illustrated has been developed to meet the need for high capacity units for water supply and sewage disposal, etc. Capable of injecting 3000 lb. of chlorine in 24 hours, it employs automatic on/off and rate controls, all of which are protected from contact with the gas.



The Chemist's Bookshelf

CHEMICAL ENGINEERING PLANT DESIGN. F. C. Vilbrandt. McGraw Hill, 1949. 3rd Ed. Pp. x + 608. 51s.

The anxieties recently expressed by successive presidents of the Institution of Chemical Engineers are made more understandable when one sees the constant stream of American books in this field. Both Mr. Hugh Griffiths and Mr. Cremer have pointed to the urgent need that top-level (and other) British chemical engineers should prepare text-books specially suited for our own peculiar conditions. While science is international, technology has rather more of a national flavour because it is conditioned by such matters as availability of metals, symbols used, pipe and valve standard sizes—and like matters which vary a little from country to country. The latest edition of a most valuable compilation by Vilbrandt emphasises the point. It is generously equipped with tables, diagrams, conversion tables and copious references to literature, but the Standards, most of the references, sources of raw materials and even the gallon used are naturally those applying to the country for which it was written.

The principal feature of the new edition is a thoroughgoing revision of the chapter on preconstruction cost estimation. But the sources are not all readily available to British workers. Arrangement of chapters remains as before. It is still a little puzzling to know why such a basic subject as "Development of the Design Project" is pushed back to Chapter VIII in a total of 13 chapters. Intrinsically, however, the book fulfils what it sets out to do—to give guidance and assistance to the engineer engaged in chemical engineering plant design. Equipment design as such is not discussed.

Starting solidly on the subject of "Foundations," Vilbrandt works through installation problems, through the development of the design project, layout and location and deals in a final chapter with cost estimating. A useful appendix is a set of major project problems for students.—I.B.

CHEMISTRY AND TECHNOLOGY OF WINES AND LIQUORS. By Karl M. Herstein and Morris B. Jacobs. London: Macmillan. 2nd Ed. Pp. 436. 36s.

The authors of this book are a consulting chemist in New York City and the senior chemist in the Bureau of Food and Drugs, Department of Health, of the same city. The first edition appeared in 1935 and in recent years there have been many advances, both scientific and technological, which have necessitated the revision of most chapters.

The scope of the book includes a general review of the art of preparing alcoholic beverages from a historical aspect and the material in these sections, therefore, is far ranging in character. The chapters dealing with distilled liquors, on the other hand, particularly the one in liqueurs, contain much valuable detailed information, including a selection of typical formulae for various products.

Further evidence of detailed information is to be found in the section on analysis of liquors. The majority of the methods given are taken from the Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists (6th ed., 1945). An important feature is the inclusion of a large number of tables throughout the text and these are supplemented by a selection of analytical reference tables at the end of the book.

For those unfamiliar with the principles of fermentation, the first four chapters are devoted to theoretical considerations of sugars, enzymes and the chemistry of fermentation. There are two chapters on yeast and one each on malt and distillation, as well as information on whisky manufacture, ageing and blending. A section on brandy, rum and gin, and a chapter on wine covers the remaining ground.

For those connected with the wine and spirit trade this book will prove most valuable and others will find much to interest them.

Technical Publications

PROPERTIES, uses and specifications of a wide range of chemicals are given in condensed form in the revised edition of "Modern Solvents and Chemicals" now available from General Metallurgical and Chemical, Ltd., London and Manchester. There are five new chapters on polyethylene glycols, hydroxyethyl cellulose, plasticisers, acetals and sulphur compounds, tables of physical properties and a useful applications index. The book has in a limited degree the merits of a dictionary of chemicals and their uses, and so will no doubt find a permanent place in many chemical industrial bookshelves.

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CHARTS of liquid-vapour equilibrium constants (two volumes) and fugacities for light hydrocarbons in mixtures (one volume) have just been issued by The M. W. Kellog Co., refinery and chemical engineers of Jersey City, New Jersey, U.S.A. The graphs are not only functions of temperature and pressure but also of the composition of both liquid and vapour phases. Pressures graduated from atmospheric to 1000 p.s.i. are covered for any mixture of hydrocarbons from methane to n-heptane, including unsaturates. Instructions and sample calculations are included for bubble points, dew points and equilibrium flash points.

* * *

AN ingenius slide rule for spot welding of mild steel is now available from the British Welding Research Association. The rule automatically supplies at a glance minimum electrode pressure, edge distance, tip diameter, material thickness, weld time and weld current.

* * *

INDUSTRIAL applications of radioisotopes and their employment in tracer and control work are described in "Radioisotopes . . . a Survey," now available from The Kellex Corporation, Broadway, New York City, U.S.A. The booklet opens with a simple explanation of what isotopes are, the difference between stable and radioisotopes and their properties, which enables the reader to understand better the rapid developments being made in this new form of industrial technique.

* * *

MUCH of the special equipment employed in the U.S. Bureau of Mines' coal-hydrogenation demonstration plant at Louisiana, Missouri, is now reviewed in a 40-page illustrated booklet which also describes the process. Among the particular items discussed are high-pressure vessels, converters, pre-heaters, heat exchangers, hydrogen and nitrogen production and compression, pumps, high-pressure tubing, flanges, fittings and valves, and low-pressure auxiliary operations. "Special Equipment in the Coal Hydrogenation Demonstration Plant" (No. 4584) is obtainable from the publications distribution section, U.S. Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa.

* * *

IN March, 1900, Wilfred E. Redfern, a young man with £4 18s. 1d. capital and much optimism, decided to set up in business. To mark its 50th year in the rubber industry, Redfern's Rubber Works, Ltd., Hyde, Cheshire, has issued a pamphlet tracing the firm's achievements in peace and war during an eventful half century.

* * *

VISUAL aids is a term that has come to include a wide variety of scientific equipment. In its new catalogue just issued W. & J. George & Becker, Ltd., London, give a comprehensive list of such apparatus under the five main headings diascopes, film strip projectors, episcopes epidiascopes, and micro-projectors.

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A USEFUL compilation of basic facts about polythene, resistance to attack, etc., is offered in a new catalogue now available from Rediweld, Ltd., Wandsworth, London, S.W. Other pamphlets deal with polythene safety jugs for handling acids and corrosive liquids, and Redivin PVC filter cloth.

* * *

IN response to inquiries regarding tests and analyses of minerals and related inorganic materials the U.S. Bureau of Mines has listed (in Information Circular 7523) laboratories prepared to carry out special testing services in addition to ordinary assays and chemical analyses, more particularly for the evaluation of mineral resources. The text has been rewritten by Bertha R. Khahold (librarian, Bureau of Mines) from the original circular "Laboratories that Make Fire Assays, Analyses, and Tests on Ores, Minerals, Metals and other Inorganic Substances," by C. W. Davis and M. W. Bernewitz, first published in 1938 and revised the following year. Descriptions of testing techniques are given.

◆ HOME ◆

Opposition to Cement Works

Vigorous opposition to the proposed establishment of a large cement works at Lydstep, on the Pembrokeshire coast, is to be raised by the executive committee of the Council for the Preservation of Rural Wales. The setting up of the works would be accompanied by the quarrying for limestone of 500 acres within one mile of National Trust property.

£3 Million More Textiles

The market value of textiles to be produced at the new factory of Courtaulds, Ltd., Carrickfergus, the most up-to-date rayon plant in the country, when in full production, would be about £3 million a year, said Mr. R. Garnsey, the local manager, in Belfast last week. The factory will go into production in four or five weeks' time and should be in full production in about a year. It will employ ultimately about 1600 workers.

Refinery's Massive Cooling Tower

The cooling tower now under construction at the new £20 million refinery for Middle East Oil at Stanlow, Ellesmere Port, will be the biggest and the highest in the world. With a diameter of 260 feet, it will rise to 340 feet, just two feet below the height of Liverpool Cathedral central tower, and exceeding by 30 feet the height of the present highest tower at Birmingham. The capacity of the present tower is 1.7 million gals. an hour; the new one will cool between three and four times as much.

Shortage of High Grade Silica

A public inquiry was held at Wrexham last week into an application by Bwlchgwyn Silica Company, Ltd., to extend local quarrying operations to an extent which might involve the removal of Bwlchgwyn village, with its 800 inhabitants, in future years. Dr. W. Davies, geological consultant to the company, said that the silica in the area was pure and high grade, and of the type that could be found only in one other place in Britain. If supplies of the right grade of silica for refractory brickmaking could not be obtained steel production would be affected. After hearing objections to the proposals, Mr. S. T. Roberts, Ministry inspector, closed the inquiry. He later visited the site.

Fluoride Treatment for Teeth

More than 3000 school children in various parts of England are to take part —with the consent of their parents—in tests to prove the effectiveness of a solution of fluoride as a protection against dental decay.

OCCA Technical Exhibition

The Technical Trade Exhibition organised by the London section of the Oil and Colour Chemists' Association will be held at the Borough Polytechnic on Thursday and Friday, April 13 and 14, from 3-9 p.m. Some 25 firms will be taking part in the exhibition.

Week's Coal Production

Output of deep-mined coal in Great Britain last week was 4,108,800 tons, a reduction of 19,000 tons compared with the previous week; while opencast workings produced 7800 tons more than the previous week, with a total of 219,100 tons. Total production for the first nine weeks of this year was 38,648,400 tons, 581,400 tons more than in the same period of 1949.

Housing for Atomic Research

Mr. C. Hinton, deputy controller of atomic research, on March 6 cut the first sod on the Chester Rural Council housing site at Great Saughall, Wirral, which is to house employees of the Ministry of Supply atomic research centre at Capenhurst. The contract provides £58,770 for 44 houses. Nearby, at Little Saughall, 42 houses are to be built at a cost of £61,744.

Chemical Works May Move

At a meeting of the West Riding Rivers Board in Wakefield it was stated that the Wyke Chemical Works, owned by A. H. Marks and Co., Ltd., Wyke, Bradford, might be transferred to another part of the country. The matter arose out of an investigation of a complaint regarding alleged pollution at the factory and the Ministry of Health had informed the Rivers Board that the company had explored the possibilities of sites at nine different places in England and Scotland. Objection had been raised to the business being transferred to what appeared to them the only suitable site. These objections, the Ministry stated, were now the subject of discussion.

• PERSONAL •

THE Willard Gibbs Medal in Chemistry, one of the highest honours in American science, has been awarded to **PROF. CARL SHIPP MARVEL**, of the University of Illinois, wartime leader in the synthetic rubber programme, and former president of the American Chemical Society. From 1944 to 1946 Prof. Marvel was chairman of the National Research Council's Panel on Synthesis of Antimalarial Drugs and one of the Board for Co-ordination of Malarial Studies.

DR. L. H. LAMPITT has been awarded the International Medal of the Society of Chemical Industry. The presentation will be made at a meeting of the society in London next month, when the doctor will deliver an address " Towards International Collaboration in Science."

DR. HERBERT W. SKINNER has been appointed temporarily head of the theoretical physics division of the Atomic Energy Establishment, Harwell, to fill the vacancy caused by the removal of Klaus Emil Julius Fuchs. Dr. Skinner, who is 49, is also head of the general physics division, and was in charge of the initial development at Harwell. Last July he was appointed to the Lyon Jones chair of physics at Liverpool University.

SIR LAURENCE MERRIAN has completed his examination of the controls in the Board of Trade and accordingly relinquishes his special appointment as Examiner of Controls. His recommendations, says the Board, have been put into effect as they have been made.

Officers appointed at the sixth annual general meeting of the microchemistry group of the Society of Public Analysts and Other Analytical Chemists were: **MR. RONALD BELCHER**, chairman; **DR. CECIL L. WILSON**, vice-chairman; **MR. DONALD F. PHILLIPS**, secretary; **MR. GERALD INGRAM**, treasurer; Messrs. **A. E. HERON, R. F. MILTON, J. SANDILANDS, C. E. SPOONER, D. W. WILSON, G. H. WYATT**, committee members.

The Privy Council has nominated **DR. J. A. GILES**, who was Chief Inspector under the Vivisection Acts, and **DR. B. A. YOUNG**, of St. Alfege's Hospital, Greenwich, to be members of the Council of the Pharmaceutical Society of Great Britain.

The vice-chancellor and syndicate of the University of Calcutta announce that the Sir Devaprasad Sarwadkikary Gold Medal for 1949 has been awarded to **SIR EDWARD APPLETON**, principal of the University of Edinburgh. The award, instituted in 1939, is made every two years. Last recipients were **PROF. P. M. S. BLACKETT** (1947) and **PROF. ALBERT EINSTEIN** (1945).

The Textile Institute is to award service medals to **MR. HUGH JAMES DORMAN**, secretary of the Belfast section from 1946 to 1949, **MR. R. G. OVERSBY**, secretary of the Yorkshire section since 1946, and **MR. T. H. ROBINSON**, a member of the Institute's council. The presentations will be made at the Institute's Royal charter celebration dinner in Bradford on March 14.

DR. J. E. HOLMSTROM, the author of the UNESCO report " Interlingual Scientific and Technical Dictionaries," is to present a paper in English on " Internationalisation of Subject Index Heads " to the British Esperantist Scientific Association, at University College, Gower Street, W.C.1, on March 14 at 7 p.m.

MR. ALEC WEBSTER, whose articles on the financial aspects of accident prevention have appeared in *Fire Protection*, has resigned his appointment of safety officer to the Association of British Chemical Manufacturers on establishing his own practice as an industrial safety consultant. He will specialise in all aspects of industrial safety, including the safe storage and handling of chemicals, disposal of waste products, chemical control, mechanical separation and related operations.

Newly appointed Regional Controller of the Board of Trade in Wales is **CAPT. H. P. K. ORAM**, R.N.(retd.). He takes up his duties on Monday next. His predecessor, **MR. H. DAVIES**, is now secretary of the Durham Divisional Board, National Coal Board.

OBITUARY

The death occurred suddenly, on February 28, of **MR. J. E. NASH**, a manager of Robert Jenkins & Co., Ltd., engineers, etc., Rotherham. Mr. Nash had been with the company since his apprenticeship there in 1908.

· OVERSEAS ·

New Stainless Steel Alloy

A new metal alloy, Armco 17-7 PH stainless steel has been announced by the Armco Steel Corporation, Middletown, Connecticut. The new alloy is said to combine excellent corrosion resistance with high strength hardness and to have good fabricating properties.

U.S. Manganese Economy

U.S. steelmakers are supporting a Bureau of Mines research project to find a method of recovering manganese from steel furnace slag. About 13.3 lb. of manganese are used in making 1 ton of steel and in the first nine months of 1949 the U.S. imported over 1 million tons. The present reclamation project could make available 400,000 tons annually it is estimated.

U.S. Loss on Tin

The Reconstruction Finance Corporation in a report to the U.S. Congress announced that it had sustained a loss of $18.5 million on its tin inventories. The corporation attributed its loss to the devaluation of European currencies and the resumption of free trading in the metal in London and Singapore. The price of tin has dropped within the past year from $1.03 to 70.43 cents per lb.

Tin Output

World production of tin in December was 14,500 long tons, an increase of 800 tons on the November figure, reports the International Tin Study Group. World output of tin-in-concentrates and of tin metal was greater last year than in 1948 according to a recent bulletin of the International Tin Study Group. There was considerable expansion in Malaya, which again was the leading producer of both types of tin.

Monsanto's Phosphate Deposits

The Monsanto Chemical Company, St. Louis, U.S.A., has obtained an option to purchase part of the extensive phosphate deposits of the Humphreys Phosphate Company, of Denver, Colorado. The deposits are near Vernal, in the State of Utah. The chemical company is to carry out extensive prospecting here, as it is doing in Florida and other western areas. Material is required for the Monsanto, Tennessee, plant, where five electric arc furnaces produce elemental phosphorus, source of phosphoric acid, upon which many of Monsanto's 122 products depend.

Free Entry of Medicinal Chemicals

The effect of a recent Government decree in Peru has been to free essential medicines, pharmaceutical products and surgical supplies from all import duties and from certain other charges.

French Technical Aid for the U.S.A.

The Sté Chimique de la Grande Paroisse is reported to have concluded with the Mississippi Chemical Corporation a contract for supplying plans and technical assistance to construct an ammonia plant in the United States.

U.S. Zinc Mine Reopened

The reopening of its Kearney zinc mine, near Hanover, New Mexico, closed since June, 1949, is announced by the Illinois Zinc Company. Operations at the company's Deming concentrating plant, which treats ores from the Kearney mine, will also be resumed.

Israel Seeking Potash Control

The proposal in Israel to nationalise the Palestine Potash Co., Ltd., has been rejected by an Israeli Government committee. The committee is understood to have recommended that a controlling interest in the Dead Sea undertaking should be acquired for Israel and that the administration should be removed there from London.

German Assets for Sale

The option right for Fr.100,000 shares of Teerfaben AG, Zurich, at present held by I.G. Farben Industrie, AG, Frankfurt-am-Main, is to be sold by the Swiss Government. Teerfaben AG deals in dyestuffs and chemical products. Particulars of the sale may be obtained from the Swiss Compensation Office, Tabstrasse 62, Zurich.

Zinc Company's New Interest

An Australian company, Sulphide Corporation, Pty., has been formed to take over the Sulphide Corporation's cement, acid and fertiliser works at Cockle Street, New South Wales. The new company, whose present paid-up capital is £A.750,000, is a subsidiary of the Consolidated Zinc Corporation. It will, besides continuing normal operations, carry out research on the production and use of sulphuric acid and processes in the production of refined zinc from zinc concentrates.

Next Week's Events

MONDAY, MARCH 13

Society of Instrument Technology

Manchester: College of Technology, 7.30 p.m. Dr. R. C. Parker: "Measurement of Surface Temperature."

Society of Chemical Industry

Leeds: University, 7 p.m. Prof. W. R. Atkin: "The Durability of Leather."

The Institute of Metals

Glasgow: 39 Elmbank Crescent, C.2, 6.30 p.m. (Scottish Section) A.G.M. G. H. Botham: "Uses of Non-Ferrous Metals in the Chemical and Food Industry."

TUESDAY, MARCH 14

Society of Chemical Industry

London: 26 Portland Place, W.1, 6.30 p.m. A. R. Burgess and G. L. Hammond: "Degradation and Weathering of Plastics and Rubbers."

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Research papers from Imperial and University colleges, London.

Incorporated Plant Engineers

Manchester: Engineers' Club, 7.15 p.m. H.M. Inspector of Factories: "Safety Requirements for Electrical Installations within the Scope of the Factory Act."

Royal Institute of Chemistry

Stockport: Central Public Library, 6.30 p.m. J. H. Carrington: "Rubber."

Hull Chemical and Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. D. E. Bellamy: "Electrolytic Copper Refining."

The Institute of Metals

Swansea: University College, Singleton Park, 6.30 p.m. (South Wales Section). F. C. Aschen: "Fuel Utilisation in the Non-ferrous Industry."

WEDNESDAY, MARCH 15

The Royal Institute of Chemistry

London: Royal Institution, 21 Albemarle Street, W.1, 6.30 p.m. Dr. J. Dewar: "The Functions of the Chemist in a Large Industrial Organisation."

Manchester Metallurgical Society

Manchester: Engineers' Club, 6.30 p.m. (with Institute of Metals). Dr. U. R. Evans: "Modern Views of the Corrosion of Metals."

Incorporated Plant Engineers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7 p.m. "The Use of Compressed Air in Industry."

Bristol: Grand Hotel, 7.15 p.m. (Western Branch). Annual general meeting. E. C. Mills: "Power Factor Correction."

THURSDAY, MARCH 16

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.15 p.m. D. H. Derbyshire and W. A. Waters: "The Significance of the Bromine Cation in Aromatic Substitution"—Parts I and II; and other papers.

Liverpool: University, 4.30 p.m. Prof. M. G. Evans: "Photo-excited Electron-transfer Reactions." Prof. E. K. Rideal: "Heterogeneous Catalysis."

Sheffield: University, 5.30 p.m. Prof. E. R. H. Jones: "Recent Developments in Acetylene Chemistry."

Edinburgh: North British Station Hotel, 7.30 p.m. (with RIC and SCI). Dr. M. Ritchie: "Some Aspects of Photo-oxidation with Reference to Chlorophyll."

The Royal Society

London: Burlington House, Piccadilly, W.1, 11 a.m. Discussion: "The Measurement of Growth and Form." 4.15 p.m. Election of fellows.

The Institute of Physics

Birmingham: University, Edgbaston, 5 p.m. (Midland Branch). Prof. N. F. Mott: "Some Advances in the Theory of Creep in Metals."

FRIDAY, MARCH 17

The Chemical Society

Birmingham: University, Edgbaston, 4.30 p.m. Prof. E. K. Rideal: "How Crystals Grow."

The Institute of Physics

London: 32 Welbeck Street, W.1, 6.30 p.m. (Electronics Group, with British Institute of Radiology): "The Biological Effects of Non-Ionising Radiations with Particular Reference to Microwaves."

Society of Public Analysts and Other Analytical Chemists

London: Royal Society, Burlington House, Piccadilly, W.1, 4.30 p.m. Annual general meeting and election of officers, followed by The Bernard Dyer Memorial Lecture by Sir John Russell.

SATURDAY, MARCH 18

Institution of Chemical Engineers

Manchester: College of Technology, 3 p.m. Dr. M. Ruhemann: "The Production of Technical Argon."

Birmingham: Prof. F. H. Garner: "Liquid-Liquid Mixing."

RECONSTRUCTION IN ITALY

Production Has Surpassed the Pre-War Level

POST-WAR reconstruction of Italian chemical industry, although initially rather slow, was accelerated in 1947-48, and by the beginning of 1949 was nearing completion.

The increasing activity in the industry is reflected by the chemicals production index (pre-war 100) which was 46.6 in 1946, 74.2 in 1947, about 80 in 1948, and for the first half of 1949, averaged 87. In June and July, 1949, it was, in fact, just over 100 (102.5) and has since continued to rise. These figures represent average or total indices for the three groups: basic chemicals, chemical products for agriculture, and chemical products for industry. For July, 1949, these were respectively: 122.4, 107.4, and 82.6.

Distribution of Chemicals

Although no exact figures are available, it may be stated that some 20 per cent of Italian chemical output is for agriculture, 30 per cent for general consumption, and 50 per cent for industrial needs.

The above estimate is derived from a report by Dr. Sanvisenti, of Milan (*Chemische Ind.*, 1950, *2*, 17-19) and supplements the review of Italian chemical industry given by Luigi Morandi last year to the Lombardy section of the Italian Chemical Society.

Since the war Italian chemical exports have risen substantially. This applies in a marked degree to sulphuric acid, alkalis, and superphosphate, although some other important items, such as copper sulphate, citric and tartaric acids, and alumina, have not made such a good recovery. Copper sulphate, in fact, is now one of the most vital imports.

Exports in tons

	1938	1947	1948	1949 Jan.-June
HEAVY CHEMICALS (Total)	94,429	39,123	156,238	41,727
Alumina (dry) ...	39,616	10,808	22,019	6,509
Sulphuric acid ...	684	4,851	9,383	7,087
Caustic soda ...	2,817	2,787	75,824	6,267
Soda ash	3,123	46	19,832	3,023
Copper sulphate	8,517	55	0.2	—
Lithopone ...	1,890	172	1,649	995
FERTILISERS (Total)	5,405	1,035	124,254	124,419
Superphosphate ...	3,317	1,011	84,617	99,983
Ammonium sulphate	432	1	26,569	20,661
ORGANIC CHEMICALS (Total)	16,600	9,806	13,507	7,648
Citric acid ...	2,486	224	708	76
Tartaric acid ...	2,003	1,429	939	889
Carbon disulphide	1,403	513	480	550
Phthalic anhydride	0.5	70	198	126

Exports of sulphur will be greatly augmented by the recently signed agreement between Italy, Australia and New Zealand, by which Italy is to supply 150,000 tons of sulphur by July 31, 1950. Total exports in 1948 were 76,096 tons, and, in January to September, 1949, 54,789 tons, France being the principal consumer.

The import figures are comparatively small. Inorganic chemicals imported during the first half of 1949 amounted to 23,141.4 tons, of which $CuSO_4$ was 10,084.6 tons. Fertilisers were 38,577 tons, and organic chemicals 13,076.1 tons.

High hopes and ambitious plans for the future are based on the fuller working of the Marshall Plan and other aid to increase production. For developing such fundamentally important products as nitrogen and phosphorus fertilisers, alkalis and copper sulphate, investments up to $63 million are being made. Large extensions will be made also in the plastics and other branches of chemical industry. Estimated production indices (1938 = 100) are as follows:—

	1948-9	1952-3
Nitrogen fertilisers	110	154
Phosphorus fertilisers	130	147
Copper sulphate	63	127
Sulphuric acid	95	140
Soda ash	105	140
Caustic soda	110	126
Dyes, etc.	110	120
Synthetic resins	110	145
Employed persons	100	132

Attainment of the 1952-53 index would mean that the number of employed would be increased to 170,000, distributed (per 1000) roughly as follows: fertilisers 23; coal products 17; petroleum refining and chemicals 15; alcohol 5; dyes 8; paints, etc., 8; drugs, cosmetics, perfumes 22; soaps, glycerin, etc., 14; other industries 58.

By 1952 sulphuric acid production should reach 1.4 million tons, which would be used mainly in the home industries (fertilisers, textiles, etc.). In the field of alkalis, present capacities, per annum, are: soda ash 210,000 tons, caustic soda 170,000 tons, and electrolytic soda 85,000 tons. Calcium carbide production will also be greatly increased. In the fertilisers industry, phosphate output should be increased to 340,000 tons in 1952-3, mostly for home use; and production of nitrogenous ferti-

(*continued at foot of next page*)

German Mineral Pigment Industry

Better Materials Supplies Have Helped Recovery

THE average turnover during three pre-war years (1936-38) of the German mineral pigment industry, including carbon black, printing ink pigments, and those used in the ceramic, textile and other industries, amounted to Rm. 200 million, of which 28 per cent was export trade.* Although it suffered heavily during the war, it has shown greater power of recovery than some other industries, partly because certain sources of important raw materials are indigenous. It it true that the loss of Polish—and Russian—occupied districts has considerably reduced the home market, yet it has not greatly affected productive capacity.

Replacing Plant and Materials

The two chief problems immediately after the war were the reconstruction of damaged or destroyed factories and procuring supplies of raw materials not available in Germany. The latter included many metallic compounds, *e.g.*, of lead, zinc, cadmium, antimony, selenium, chromium, boron; also resins and drying oils.

The practical elimination of the I. G. Farbenindustrie, the principal supplier of intermediates and organic pigments, was a further serious loss. Since the currency and exchange reform conditions were improved, however, factories have been rebuilt and restored, and raw materials become more freely available.

The rate of recovery has necessarily varied in different sections of the industry. Suppliers of carbon black, etc., for the rubber manufacturers and of zinc oxide and zinc white, who appeared to be making a fairly quick recovery, experienced a set-back resulting from the demolition of the Buna factories and the importation of American tyres. New types of black are, however, being developed for rubber and for the paint industry.

In the enamels field there was an unexpectedly large demand for use in the porcelain factories. Compounds of lead and boron are said to be in sufficient supply, and increased demand for enamelled goods derives, partly at least, from the growing preference of the German housewife for these in place of aluminium vessels. Manufacturers of enamelled goods who previously made their own enamels are now coming to rely on specialised producers of the coating.

Owing to the separation of the Polish and Russian zones and of the Berlin zones, the market for lead compounds—litharge and red lead—has been deprived of some of its principal buyers. These included the manufacturers of accumulators, crystal glass and ceramics. The market is further limited by the high price of lead oxides and other compounds.

Prospects in the printing ink section are much more favourable, now that paper supplies are more adequate, and illustrated books and journals, including technical periodicals, can be published on a larger scale, with plentiful use of coloured illustrations.

There are interesting developments, too, in printing on plastic or other synthetic films and on various new textile materials, all of which will constitute a large and growing field for printing inks and for the different pigments required in their production. Further attempts are being made to formulate quick-drying inks, such as those which react well with infra-red rays.

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* Representing a summary by Dr. Hans Bolte, published in *Chemische Industrie*, December 1949 (pp. 298-300).

RECONSTRUCTION IN ITALY

(continued from previous page)

lisers is planned to be 210,000 tons (in terms of N) of which about one-quarter would be for export. Copper sulphate output should reach 140,000 tons.

The plastics industry is relatively new in Italy. Present capacity, per annum, is 27,000 tons, of which phenol and cresol resins account for 12,000 tons and urea resins 6000 tons. By 1952-53 it is hoped to increase output to 32,000 tons, of which 2000 tons should be available for export.

In 1940 there were about 800 factories, mostly small, engaged in the manufacture of pharmaceuticals and cosmetics, and employing 20,000 workers. The industry is still largely in the hands of relatively small firms but there is an increasing number of local associates or branches of foreign companies. Sandoz S.p.A. (Milan), Geigy S.p.A. (Milan), and S.A.I. Laboratori Glaxo (Verona) are among the most important of these.

BARYTES MINING IN SCOTLAND

Good Prospects of Supplementing Dwindling Deposits

THE mining of barytes, one of Britain's most ancient mining industries, is of greatly increased importance to-day owing to the numerous uses of the mineral in modern chemical processes.

The danger, foreseen by the Mineral Development Committee, that if the 1947 output of barytes is maintained present workings may be exhausted within 10 to 20 years deserves some attention, and the need to discover supplementary supplies is more than ever important (THE CHEMICAL AGE, *61*, 187). Whether the Central Land Board, now responsible for the exploitation of privately owned land where mineral deposits are found to exist, will carry out its task more efficiently than have the owners remains a matter of conjecture.

Evidence that Scottish mining concerns have by no means been dilatory in the work of exploration in recent years is available in an article recently presented in *The South African Mining and Engineering Journal* (*60*, Part II, 681), abstracts of which are reproduced here.

Versatility

It recalls that the most common application for barytes is in the manufacture of lithopone, which accounts for more than half Britain's consumption. Barytes is also used extensively in the production of hydrogen peroxide and blanc-fixe. Other uses are in the manufacture of paints; as a filler in the manufacture of linoleum, rubber and asbestos goods; in the production of wallpaper, Bristol board, fertilisers, insecticides, soap, tiles, glazes, textiles, and various leathers. As a thickening agent barytes is used to increase the specific gravity of the washing fluid in the Barvois process of coal-washing.

As a shield against X-rays barytes is mixed with rubber to form X-ray tube casings, or with plaster for application to the walls and ceilings of X-ray rooms.

Although the world's principal sources of barytes are the U.S.A. and Germany, large quantities are mined in the United Kingdom. Scotland, where 18,500 tons was produced in 1947, was responsible for nearly one-quarter of the total British output. One of the largest single producers in that country is the Gass Water mine near Muirkirk, Ayrshire.

The rich veins there have been known since before 1870 but were not opened up until 1917. The spar was wrought opencast and by stoping from an adit level, but the total amount raised in four years was only 7976 tons. Operations were started by the present lessees in 1923 and since that date the Gass Water mines have produced over 400,000 tons of barytes.

Four sub-parallel veins have been exploited and the workings extend intermittently for 1⅔ miles. Annual production of the mine has averaged about 19,000 tons over a long period.

Development Plans

At present some 40,000 tons of barytes are proved and blocked out, which is sufficient for two years at the current production rate. Normal development should enable the mine to continue in operation for at least five years, and prospects of a considerably longer life are regarded as reasonably good.

At the Muirshiels Mine, in Renfrewshire, mining for barytes is believed to have been more or less continuous from shortly after the middle of the 18th Century until 1920, though annual production was never very large. After lying idle for over 20 years the mine has been opened up again by new lessees, who have embarked upon an extensive programme of exploration and development.

The greatest width of barytes proved there so far is about 12½ ft., but pockets up to 30 ft. wide have occasionally been encountered.

After seven years, 40,000 tons of barytes have been raised and current production is just over 1000 tons a month. Proved reserves are said to amount to about 70,000 tons, with probable reserves of a further 50,000 tons.

For the past six years barytes has been stoped at a depth of 110 ft. Now a shaft has been sunk 200 ft. below the intermediate opencast and the level has been driven at this horizon for 200 ft. south and 700 ft. north in solid barytes all the way. This development is still going on, and, since the shaft at 200 ft. is still in barytes, it is proposed to sink it further.

Further exploration in a number of Scottish districts, in some of which mines have been worked previously, appears to offer promising prospects. In Kirkcudbright a small mine has lately been reopened and barytes is known to occur in at least three other counties.

The Stock and Chemical Markets

BUSINESS in all sections of stock markets has remained on a small scale owing to political uncertainties. The Government's programme, as outlined in the King's Speech, confirms that it is hoped to keep in abeyance major schemes for changes in industries, pending the next election.

Caution continues to characterise policy in the markets partly because the Budget, expected on April 18, will provide a test of strength. There appears to be a widespread belief that if the Government survives its Budget proposals, it may manage to remain in office until the Autumn. It may be possible to postpone a General Election until early next year.

The next few weeks should, however, provide a clear indication of the Government's attitude to such questions as dividend limitation and bonus share issues. The City believes there can be no question of legislation to make dividend limitation compulsory. It is pointed out that although earnings of the more efficient companies may improve, changing conditions in home and export markets, and growing competition and rising prices of raw materials mean that a wide range of companies have to face reduced profits in the future. In many cases the indications are that it will be difficult to maintain dividend payments.

Shares of chemical and allied companies have moved narrowly, apart from Imperial Chemical, which rose sharply to 42s. 3d., on news of the company's important American offer. The transaction would be financed by bank loans in New York and lead to a substantial increase in the flow of dollar earnings to the United Kingdom. The deal would mean that I.C.I. will have a medium whereby its own dyestuffs and other synthetic chemical products could be readily marketed in the U.S.A.

Monsanto Chemical 5s. shares showed firmness at 50s. 9d., Albright & Wilson were 28s. 9d., Boake Roberts 25s. 6d., Brotherton 19s. 3d., and F. W. Berk 14s. 3d. Amber Chemical 2s. shares were 4s. 9d., and Pest Control 5s. shares were 7s. 10½d. Fisons, at 28s. 3d. kept steadier, awaiting official news of the company's new capital plans. British Glues 4s. shares were 20s., at which there is a yield of 4⅞ per cent on the basis of last year's 25 per cent dividend.

British Oxygen, at 94s. 6d., have been well maintained, awaiting the results due in a few weeks; the market is continuing to talk of a big new issue, possibly on bonus terms, to shareholders.

British Aluminium, at 41s., held their recent improvement, but Turner & Newall (77s.) and United Molasses (37s. 3d.) turned easier, and the 4s. units of the Distillers Co. were slightly lower at 17s.

Iron and steel shares were again mostly lower on balance, with United Steel 25s., Stewarts & Lloyds 52s. 3d., Colvilles 33s., Dorman Long 29s., Hadfields 26s. and Beardmore 40s. 6d. Elsewhere, Staveley were 77s. and United Glass Bottle Manufacturers 68s. 9d.

Triplex Glass eased slightly to 18s. 6d. and Tube Investments, at £5½, were also easier. Boots Drug changed hands around 47s. 9d. in the early part of the week. Glaxo Laboratories (45s.) were firmer and Borax Consolidated (53s. 9d.) have been well maintained.

Oil shares, after being firmer, became easier as a result of the news that further financing by the ECA of refinery expansion plans of British oil companies is being withheld.

Market Reports

QUIET and steady conditions are again reported from the many sections of the industrial chemical market, with new contract business on a moderate scale. Buyers are exercising prudence in the face of the uncertain economic position, but spot or nearby delivery transactions have been reasonably good and the flow of overseas inquiry has been maintained at a satisfactory level. Among the soda products there has been a good inquiry for sulphite of soda, nitrate of soda and chlorate of soda and available supplies of the potash compounds are finding a ready outlet. There have been no further price changes for white lead and red lead and a steady trade is passing in both materials. There is little of outstanding interest to report on the coal tar products market and the volume of trade both for home and export shows little improvement. There is a fair demand at keen rates for cresylic acid and the xylols are firm on a good demand.

MANCHESTER.—Firm price conditions have continued in almost all sections of the Manchester chemical market during the past week and a generally strong undertone is expected to continue. Home-trade deliveries of the leading heavy

(*continued at foot of next page*)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Classic Chemicals Ltd., Radcliffe. (M., 11/3/50.) February 1, £4945 14s. 1d. charge, to S. G. Dentith, Salford; charged on 11, 13 and 15 Bury Road, Radcliffe. *£200. Dec. 31, 1948.

Eucos Products, Ltd., London, N.W., chemical manufacturers. (M., 11/3/50.) Feb. 11, £3000 debentures, part of a series already registered. *£6000. May 23, 1949.

Satisfaction

T. Lucas & Co., Ltd., Bristol, chemical manufacturers. (M.S., 11/3/50.) Satisfaction February 8, of charge registered January 30, 1936.

Increase of Capital

The following increase in registered capital has been announced: Anglo Chemical & Ore Co., Ltd., from £10,000 to £50,000.

New Registrations

Ballbrook Scientific Glass Blowing Co., Ltd.

Private company. (478,831). Capital £100. Directors: E. L. Silverstone, M. Miller, and G. Naisby. Reg. office: 11 Albert Square, Manchester, 2.

Harland & Co. (London), Ltd.

Private company. (478,847). Capital £100. Import and export merchants of chemicals, nitrates, minerals, etc. Directors: J. C. Harland and W. E. Harland. Reg. office: 23 Bedford Row, W.C.1.

Nelsons Acetate, Ltd.

Private company. (478,937). Capital £20,000. Makers of chemicals, chemical solutions, cellulose acetate, vitriol and bleaching and dyeing materials, etc. Directors: E. W. Stansbie, C. E. Bargh, C. E. Allpress, G. C. Westgarth. Solicitors: Smith & Smith, Burnley.

Lydbrook Chemical Company, Ltd.

Private company. (478,934). Capital, £200. Manufacturers of chemicals, charcoal, acids, anti-corrosives, oils, greases, etc. Directors: A. H. Churchouse, F. C. Goldsworthy. Reg. office: Castle Main, Parkend, Lydney, Glos.

Company News

Barbet, Ltd.

The head office of Barbet, Ltd., has moved from 46 Fredericks' Place, Old Jewry, E.C.2, to 175 Piccadilly, W.1. The company, which is the English house of the Société Barbet, has recently been reorganised. Its present directors are: Messrs. P. Barbet, M. V. Girard and C. H. Tanner. Barbet, Ltd., is engaged in the supply of distillation plant of French and of English manufacture.

Murex, Ltd.

An interim dividend on ordinary stock of 4 per cent, less tax, for the year ending April 30, 1950, has been declared by the Murex board. It will be payable on March 31.

Redfern's Rubber Works, Ltd.

Net profit for the year ended December 31, 1949, after provision for tax, was £38,316. Final dividends of 8¾ per cent on the "A" and "B" preference shares, and 5 per cent on ordinary shares plus a bonus of 5 per cent. were recommended. £20,252 was carried forward.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

chemicals under contract have been on a satisfactory scale and there has again been a fair amount of fresh inquiry from domestic consumers and shippers. A steady improvement is reported in several descriptions of fertilisers and new business has been fairly extensive. The demand for the tar products has been maintained at around its recent level.

Glasgow.—The trend of the Scottish chemical market has been firmer, order books being well filled. In general, the delivery position is satisfactory and no price changes have been noted. The supply position of toluol and xylol, however, continues to be difficult.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the manufacture of acetic anhydride.—Distillers Co., Ltd., A. Elce, H. M. Stanley, and K. W. H. Tuerck. Feb. 28 1947. 635,054.

Synthesis of hydrocarbons. — Phillips Petroleum Co. Aug. 28 1946. 635,219.

Manufacture of formaldehyde.—A. H. Stevens. (G. L. Cabot, Inc.). Aug. 28 1946. 635,220.

Process for producing carbides of tungsten and/or of molybdenum and their sintered alloys.—Soc. Le Carbone-Lorraine. Aug. 19 1946. 635,121.

Preparation of beta-acyloxy carboxylic acid compounds.—B. F. Goodrich Co. Sept. 3 1946. 635,347.

Beta-substituted carboxylic acid compounds and method of preparing same.—B. F. Goodrich Co. Sept. 4 1946. 635,348.

Adhesive cement compositions, composite structures employing said adhesive cement compositions and methods of making said adhesive cement compositions.—Minnesota Mining & Manufacturing Co. Dec. 17 1946. 635,130.

Method of production of synthetic material from starch or starch-containing substances.—D. Horsak. Jan. 15 1947. 635,274.

Method of producing antisera of high strength.—Ciba, Ltd. Feb. 5 1947. 635,284.

Compositions for combating noxious organisms and processes for the preparation thereof.—N.V. De Bataafsche Petroleum Maatschappij. Feb. 5 1947. 635,134.

Polymerisation of vinyl compounds.—De Trey Frères Soc. Anon., and P. Castan. Jan. 23 1948. 635,074.

Production of mono-chlor-alpha-chlor ethyl-benzene.—Distillers Co., Ltd., and W. Webster. March 19 1948. 635,280.

Organic antimony compound and process of preparing same.—Sterling Drugs. Inc. April 24 1947. 635,367.

Compositions prepared from oil-modified alkyd resins.—British Thomson-Houston Co., Ltd. April 29 1947. 635,286.

Method of and apparatus for purifying liquid hydrocyanic acid.—American Cyanamid Co. May 6 1947. 635,288.

Means for separating liquid particles from gaseous fluids.—Babcock & Wilcox, Ltd. May 29 1947. 635,241.

Production of organic acids.—Carnegie Institute of Technology. June 27 1947. 635,088.

Preparation and use of agents for combating noxious organisms.—N.V. De Bataafsche Petroleum Maatschappij. May 30 1947. 635,085.

Polyvinyl acetals.—E. I. Du Pont de Nemours & Co. July 4 1947. 635,294.

Separation of isobutylene from hydrocarbon mixtures.—Standard Oil Development Co. July 8 1947. 635,150.

Manufacture of phenanthridine compounds.—Wellcome Foundation, Ltd., L. P. Walls, and N. Whittaker. July 6 1948. 635,152.

Separation of gaseous mixtures.—Koppers Co., Inc. July 29 1947. 635,298.

Process for producing detergents of the alkyl aromatic sulphonate type.—Universal Oil Products Co. Aug. 6 1947. 635,308.

Manufacture of anhydrous caustic potash.—I.C.I., Ltd., and A. G. M. Hedley. Dec. 10 1948. 635,175.

Manufacture of iron oxide colouring matters.—I.C.I., Ltd., P. J. Atkins, and J. B. Peel. Dec. 15 1948. 635,177.

Sodium bicarbonate.—I.C.I., Ltd., and E. Ellis. Feb. 25 1949. 635,393.

Device for producing chemical reactions in a flowing gas by means of high-frequency electrical-discharges.—W. W. Triggs. (Patelhold Patentverwertungs- & Elektro-Holding A.G.). Sept. 8 1944. 635,398.

Process for the manufacture of hydrocarbon polymers.—C. Arnold. (Standard Oil Development Co.). May 10 1946. 635,757.

Process for the manufacture of carbides of the refractory metals.—Régie Nationale des Usines Renault. July 26 1946. 635,972.

Process for the production of butylene glycol and acetyl methyl carbinol.—Usines De Melle. July 30 1946. 635,973.

Process and apparatus for making carbon black.—Phillips Petroleum Co. Aug. 26 1946. 635,898.

Dehydrogenation of alkyl aromatic compounds.—Koppers Co., Inc. Sept. 12 1946. 635,827.

Pipe stills for the continuous distillation of tar.—Newton, Chambers & Co., Ltd., H. C. Mann, and L. S. Brown. Oct. 15 1947. 635,982.

High molecular weight copolymers, more especially as lubricating oil additives.—C. Arnold. (Standard Oil Development Co.). Oct. 28 1946. 635,903.

Vinyl-resin synthetic rubber compositions and method of preparing same.—B. F. Goodrich Co. Oct. 30 1946. 635,986.

Preparation of catalysts and their use in the manufacture of gasoline.—Davison Chemical Corporation. Dec. 23 1946. 635,992.

Manufacture of siloxane resins.—Dow Corning Corporation. Jan. 21 1946. 635,994.

Preparation of a soluble form of riboflavin.—Merck & Co., Inc. Feb. 20 1947. 635,778.

Oxidation of solid carbonaceous materials.—C. Arnold. (Standard Oil Development Co.). March 31 1947. 636,033.

Production of industrial mixtures of carbon monoxide and hydrogen.—J. C. Arnold. (Standard Oil Development Co.). March 31 1947. 635,909.

Acrylonitrile.—American Cyanamid Co. April 10 1947. 636,084.

Process of producing diammonium phosphate and the product resulting therefrom.—Monsanto Chemical Co. April 11 1947. 636,035.

Manufacture of cyclo-alkadienes.—Standard Oil Development Co. April 15 1947. 635,910.

Synthetic resinous compositions.—General Aniline & Film Corporation. April 25 1946. 635,911.

Process for the partial depolymerisation of polymerised methyl methacrylate.—Soc. Générale de Constructions Electriques et Mécaniques (Alsthom). May 17 1947. 635,912.

Production of synthesis gas mixtures containing carbon monoxide and hydrogen.—Standard Oil Development Co. Sept. 27 1946. 635,913.

Production of crystalline magnesium hydroxide.—W. C. Gilpin. June 2 1948. 635,781.

Electrodeposition of metals or alloys.—Udylite Corporation. June 24 1947. 636,050.

Copolymers of acrylonitrile with lesser amounts of conjugated dienes.—B. F. Goodrich Co. July 23 1947. 636,055.

Methods of humidifying air.—W. W. Cummings, Jun. July 25 1947. 636,056.

Preparation of organo-silicon resins.—M. Todd, C. Shaw, and W. E. Langrish-Smith. July 21 1948. 635,927.

Insecticidal compositions.—Harvel Corporation. July 30 1947. 635,846.

Polymerisation of butadiene-1, 3 hydrocarbons.—B. F. Goodrich Co. July 21 1947. 635,787.

Process for the production of di- and trichloracetaldehydes and acetals thereof.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 20 1947. 635,789.

Production of ketones.—United States Rubber Co. Aug. 18 1947. 635,934.

Process for preparing anisole.—E. I. Du Pont de Nemours & Co. Sept. 27 1947. 635,853.

Process for the recovery of hydrocarbon-substituted ammonium nitrites and the like.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 16 1947. 636,073.

Impregnation of porous articles with carbon.—C.D. Patents, Ltd., C. D. Greaves, and W. D. C. Walker. Nov. 22 1948. 635,796.

Cyanalkyl ether plasticisers and synthetic resin compositions plasticised therewith.—Distillers Co., Ltd., and D. Faulkner. Dec. 14 1948. 635,866.

Synthetic resin.—E. H. G. Sargent. Dec. 20 1948. 635,798.

Process for the production of 2-(p-amino - benzene-sulphonyl-amino)-pyrimidines.—Cilag, Ltd. Feb. 23 1948. 635,876.

Magnetrons.—British Thomson-Houston Co., Ltd. Sept. 10 1945. 635,479.

Method of preparing lubricating oils.—Compagnie Française de Raffinage. July 3 1946. 635,689.

Production of fluoboric acid.—Aluminum Co. of America. Aug. 8 1946. 635,551.

Production of aluminium-ammonium fluoride.—Aluminum Co. of America. Aug. 8 1946. 635,552.

Production of aluminium fluoride from aluminium-ammonium fluoride.—Aluminum Co. of America. Aug. 8 1945. 635,553.

Process for manufacturing phosphorus products and alumina and eventually hydraulic cements.—J. S. Seailles. Aug 28 1946. 635,612.

Thixotropic gel systems.—Sharp & Dohme, Inc. Oct. 8 1946. 635,559.

Apparatus for carbonating milk and other liquids.—E. Potter. (F. Lee.) Oct. 10 1946 635,560.

Methods of making organic hydroxy esters and the organic hydroxy esters resulting therefrom and the compounded lubricants including the organic hydroxy esters.—Monsanto Chemical Co. Feb. 5 1947. 635,708.

Process for producing hydrogen.—Universal Oil Products Co. March 3 1947. 635,493.

Process for refining vegetable and animal oils.—A/B Separator. March 20 1947. 635,571.

Manufacture of polymers of propylene.—C. Arnold. (Standard Oil Development Co.). April 18 1947. 635,576.

Process for separating sterols from oil concentrates.—Distillation Products, Inc. May 1 1947. 635,497.

Breaking water in oil emulsions.—W. Killner, A. S. C. Lawrence, and D. C. Ford. June 9 1948. 635,717.

RUST REMOVAL

New Brush or Immersion Treatment

A GENERAL purpose and economical rust removing material, which can also be used for the removal of corrosion products from aluminium and its alloys, has been recently introduced by the metal finishing division of The Pyrene Co., Ltd., Brentford, Middlesex. The makers claim that Preperite, as the new product is called, can be used either as a brush-on material or made up for the treatment of parts by immersion in a tank.

As an immersion solution an important feature claimed is that it does not need to be discarded at regular intervals and replaced by a freshly made up solution, but will continue in service indefinitely, provided that it is maintained by replenishment of the chemical as necessary. Additions required are determined by means of a simple chemical test.

Another feature of the solution is that it can be used cold or heated to any temperature up to 140°F., the warmed solution having the advantage of speed.

When used for the removal of rust, a prior degreasing operation is necessary in most cases. Degreasing can be carried out by any suitable method such as solvent wiping.

An immersion solution is made up to a concentration of one part of Preperite to two parts of water for use either cold or hot. The tanks required to hold the solution, in the case of a permanent installation, should be lined either with lead or rubber, but tanks of suitable glazed earthenware can also be used.

Following treatment by immersion, work may be rinsed, by hot or cold immersion, by hosing or any other suitable method.

When applied by brushing, dilute with tap water to a concentration of two parts of Preperite to one part of water. In all normal circumstances, a 5-minute application should be sufficient to remove the rust, after which the metal surface may be rinsed off with either hot or cold water.

Methods by which the new product can be applied to aluminium and its alloys are similar to those used for steel. Concentrations of the solution will, in most cases, be the same, but greater dilutions may be possible.

On aluminium surfaces it is claimed that an etch is left which is beneficial for paint bonding.

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Petroleum Planning

WHETHER petroleum industry in Great Britain is in its infancy or its adolescence has never been satisfactorily established. Any estimation of the kind depends upon varying conceptions of the growth yet required to bring it to maturity. Perhaps the only common ground is that petroleum industry—refining, chemical derivatives and the plant required for all these things and the winning of the oil itself—is a lusty young thing with great expectations. How highly its potentialities are rated by Americans deeply experienced in oil economy is attested by the uneasiness recently revealed about the current British policy to make fuller use of our own Mediterranean and Middle Eastern oil resources and the curtailment of the liberal Marshall Aid for constructing British refineries at home and abroad. Yet, before very long, the U.K. refinery capacity will be five times greater than it was before the war, there will be three petroleum-based chemical plants and two others to make special materials from oil, notably for the plastics industry.

All these portents emphasise how essential it is that there should be the maximum development in the shortest time of the home production of petroleum equipment—of all kinds. The extent to which this has already been secured may be roughly gauged by reference to the exports of such plant: in 1939 it was valued at £11 million; in 1949 at £63 million. That evidence alone does not automatically dispose of the criticism voiced not long ago by representatives of some of the great oil refining companies: that British plant was unnecessarily costly, sometimes not well adapted to current requirements and often slow to arrive where it is wanted. It would be surprising if some of these charges were not justified, when it is borne in mind how young is this branch of chemical engineering, largely neglected for six years in favour of more immediate wartime needs and since then denied the support of a large-scale petroleum industry and its associated technology.

Those deficiencies are now in process of being made good and there are reasons to expect an increasingly integrated policy by U.K. makers of petroleum plant, to secure the valuable rewards awaiting here and overseas, in the very active existence of regulating and advisory bodies such as the Council of British Manufacturers of Petroleum Equipment. That council, founded in 1943, has brought together representatives of almost every interest serving

On Other Pages

Leader:

Petroleum Planning . . 389

Notes and Comments:

Selling to America . . 391
Chemical Markets in India . . 391
The New Carbon . . 391
Study of Dermatitis . . 392
Science Books . . 392
Bauxite Development . . 393
Artificial Filaments . . 393
Dutch Chemical Expansion . . 393
Dollar Aid for Carbon Black . . 393
End of Molasses Control . . 393
Basic Chemicals in December . . 394
U.K. Lead Price Reduced . . 394
U.S. Alkali Processes . . 395
Advances at Cornell . . 395
New Zealand Chemical and Mineral Industries . . 396
Mechanical Drying Methods . . 397
£169,000 Crown Grant for Anodising Process . . 398
Modern Terpene Resins . . 401
Natural Gas Source of Canadian Sulphur? . . 402
Mechanised Plant Operation . . 403
Noble Metal Catalysts . . 404
Impervious Carbon Products . . 405
Letters to the Editor . . 410
Parliamentary Topics . . 410
German Exhibition of Chemical Apparatus . . 412
Fuel Research in Spain . . 414
W. German Production Increases . . 415
Reviving German Lacquer Industry 416
Hydrocarbon Studies: The Vapour Phase . . 422

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the petroleum industry in all its fields, not excluding prospecting and drilling. It aims to serve the interests of 360 members (there were 15 in 1943) and of petroleum industry by directing attention to equipment technology, to the materials and services being sought, and by an elaborate liaison system to make known technical and statistical information and all the type of world news which can help to shape plant makers' policy. Petroleum industry itself may benefit almost as much by the information on availability of equipment and services, on which the council can speak with authority.

Another promising development with similar aims was represented by the creation, at the request of the council in 1945, of the Petroleum Equipment Industry Standards Committee, a protegeé of the British Standards Institution, combining the interests of makers and users. Sub-committees of this group have in hand one of the most urgent problems of the moment, that of bringing British material into line, dimensionally, physically and chemically, with similar American material in common use.

Minor differences between British petroleum appliances and the American equivalents, upon which most users formerly depended, is likely to have been the cause of most complaints in the past. Some degree of leadership evidently belongs to the much more mature and privileged American industry, but there are inevitable difficulties involved in such "remote control," which the British groups are designed to minimise. Rapid deliveries cannot be secured when, as in one actual example, a British manufacturer is asked to quote for a piece of equipment designated "as illustrated in Fig. 106 in . . ." an American brochure.

In view of the importance of petroleum equipment as a means both of saving and earning dollars, every effort is being made to take full advantage of the very favourable markets which exist. The country which has led the world in radar and jet-propelled aircraft will not be expected to lag behind in the production of oil equipment, least of all after experiencing the degree of success which has already been achieved in building up the new industry during a period of exceptional difficulties.

Notes and Comments

Selling to America

IT is becoming very apparent that there is room in the U.S.A. and Canada for British goods, provided they are selectively marketed and presented in a way acceptable on the other side of the Atlantic. The congress held in London this week, organised by the Incorporated Sales Managers' Association and the (U.S.) National Sales Executives, emphasised the truth of this. The diffidence that is sometimes felt here about the ethics and prospects of an attack on the traditional American home markets finds no encouragement at all in the advice given this week by the team of American sales managers discussing " Sales Planning for Dollar Markets." Mr. G. J. Ticoulat, who manages the sales of the Crown-Zellerbach Corporation, San Francisco, gives the assurance that America wants competition and welcomes any stimulus to trade—even a foreign one. One of the lessons which this congress has made very clear is that the only entirely satisfactory way of learning the peculiar and often exacting requirements of a product in the U.S. markets is to go there yourself, study contemporary products and production methods there and decide how a British manufacturer could improve on them. The last is certainly not impossible if full advantage is taken of the cheap sterling factor.

Chemical Markets in India

THE reluctance to talk about their affairs, in which some chemical industries rival the " Silent Service," cannot entirely disguise the remarkable character of overseas chemical trading performance. The commentary which comes from time to time from outside sources is helping to set in perspective the magnitude of last year's achievement in selling to overseas users over £86 million worth of chemicals, £2.5 million more than in 1948. That the receptive markets which existed immediately after the war are no longer the common phenomenon is shown by the significant evidence about Indian sales, which the U.K. Senior Commissioner in India has provided. This reflects, among other things, the effects of the continued campaign in India to restrict or exclude foreign chemicals whenever there are possibilities that home industries could supply the needs. The success of the " import resistance movement " in India—although it was, of course, not the only factor—may be seen in the fact that chemicals and preparations and dyes and colours were the only groups among India's staple imports which suffered reductions in 1949. The value of the first fell from approximately £9.3 million (in 1948) to £7.8 million, and dyes and dyestuffs also were cut by about £2 million, to £4.8 million. There is, fortunately, no element of discrimination against this country in these results. In one six-month period (to September 30, 1949) the United Kingdom raised its sales of all kinds to India to £70 million, compared with £47.3 million in the same half of 1948), while the U.S.A., before devaluation and in spite of its growing participation in Indian economic affairs, had to forgo trade worth £2.4. Its total for the six months was only £73.7 million.

The New Carbon

THE likelihood that any given chemical engineering project may take a new and possibly simplified appearance because of the development of a new constructional material is an incalculable factor which no chemical engineer can afford to overlook. The probability is continually increased by the ability of present-day technology to offer " rare " metals in comparative abundance. The most significant new advance in this direction departs from the conventional in that it is not a metal and utilises a raw material which even today is a cheap and abundant starting material—coking coal. Added now to the vast field of usefulness of coal is a technique for converting the mined product itself, not one of its innumerable progeny and colaterals, into a form of carbon which has, in addition to the characteristic chemical inertness and resistance to high temperatures, a good strength: weight ratio, imperviousness to liquids and gases and some other properties which few metals or ceramics combine so well. Basically, the source of the important new properties and adaptability of Delanium—the name coined by the Powell Duffryn group, which originated it—is the observation that coking coal, like some other carbonaceous materials, can be induced to harden and contract (up to 45 per cent by volume) in the plastic stage of its thermal composition to produce a graphitic carbon of extreme density, bonded by intimate carbon-carbon linkages. That is necessarily an over-simplification of a considerable physico-chemical achievement. Its likely results in the form of improved efficiency, durability and space saving in the construction of heat exchangers, tower packings and vessels for chemicals and gases will be looked for with interest.

Study of Dermatitis

A BOGEY of medical research—industrial dermatitis—which has defied so long the provision of generally effective cures, was conjured up last week in some of its more aggressive moods. The occasion was the first showing in London of the film "Industrial Dermatitis" by I.C.I., Ltd., at the British Council Film Theatre. The main intention of the film seems to be to show British industries, particularly the manual worker, the hazards which dermatologists consider the worst. The classes of industrial workers liable to attack by one or other form of dermatitis would appear to be almost unlimited. The coal and coal tar using industries are extremely vulnerable; dust and oils, particularly coal dust and cracking oils, are shown in the film to be among the worst irritants causing skin disorders. But even agricultural workers, who might excusably think theirs a sheltered occupation in this regard, can frequently be affected by such apparently innocent substances as the juice of vegetables, fruits and woods; celery dermatitis is a highly unpleasant form of the disease. I.C.I. took the wise course of mentioning none of their proprietary protective products, and the undoubted value of the film was enhanced by its disinterested approach. The value of that service to industry at large was acknowledged by the Minister of Labour (Mr. George Isaacs) who was one of the audience at this film show.

Science Books

FOR the achievement of having made available to any reader possessed of moderate intelligence and perseverance simplified accounts of scientific events which would have amazed great scientists a century ago, a good deal of the credit must go to the free public libraries. The century which has produced such fundamental changes in scientific horizons and in the means of interpreting them has been the growing period of the free reading principle. Just 100 years ago this year the Public Libraries Act, enabling borough councils to spend the equivalent of a rate of ½d. in the £ on library service, was given rather grudging sanction. Library records since that time have reflected the widest fluctuations in public taste with, in recent years, a steadily increasing readiness to accept popular, and even comparatively advanced accounts of scientific matters. This "unnatural" taste is far from being a passing phase and its growth is giving almost as much satisfaction to some farsighted members of the scientific fraternity as to the publishers. The standpoint of the former was recently epitomised by the secretary of the Department of Scientific and Industrial Research. "An informed democracy is a safe one," said Sir Ben Lockspeiser, "and the more people understand, the greater the likelihood of our science being used to the best advantage.

BAUXITE DEVELOPMENT

ECA Aid for Jamaican Projects

AN ambitious scheme to promote the development of bauxite mining in Jamaica was recently announced by the ECA mission to the United Kingdom. It is intended to provide a new source of dollar earnings for the sterling area and to help conserve the supply of bauxite in the U.S.A.

Under the terms of a contract signed between ECA and the Reynolds Metal Company of Richmond, Virginia, and its subsidiaries, Reynolds Jamaica Mines, Ltd., and Reynolds Mining Corporation, ECA has agreed to advance up to $5,968,000 from its funds and £1.8 million from ECA counterpart funds in Britain.

The funds advanced to the Reynolds Metal Company and its subsidiaries will be used to purchase and install mining, milling and transport equipment. Repayment in the form of finished aluminium will be made to the U.S.A. over a period of 20 years.

The Reynolds Metal Company has already spent some $1 million on exploration and may spend a further similar sum.

Dutch Chemical Expansion

THE Allied reparations authorities have decided that part of the alkali electrolysis plant of Ludwigshafen shall be allocated to a soda plant in Holland which was dismantled and transferred to Germany during the war.

A plant for manufacturing synthetic detergent of the Teepol type has been set up at Pernis, near Rotterdam, by the Bataafsche Petroleum Mij, a subsidiary of Royal Dutch Shell.

A new company, Titaan, N.V., has been founded at Rotterdam, to produce dyes and other chemical and metallurgical products.

DOLLAR AID FOR CARBON BLACK

The ECA has proferred further support to the Godfrey L. Cabot enterprise shortly to produce carbon black in the U.K. using advanced American methods. It takes the form of an increase of the industrial guarantee of convertibility of sterling to the equivalent of $2,025,000 extended to the parent organisation, Godfrey L. Cabot, Inc., Boston, Massachusetts.

ARTIFICIAL FILAMENTS

Six Per Cent More Rayon

THE continued rapid growth of artificial fibre production and recognition that one of the new filaments, nylon, is not yet perfectly adapted to some textile uses have been given prominence this week.

The production of rayon in January totalled 29.5 million lb. This, states the *Board of Trade Journal,* surpassed by 6 per cent the previous peak figure of November, 1949.

Output of continuous filament yarn was 16.0 million lb. and exceeded the November figure by 2½ per cent, while production of staple fibre, at 13.5 million lb., was almost one-tenth higher than the previous best in September last.

Comparison with January 1949 shows total output nearly two-fifths higher, continuous filament yarn rising by one-sixth and staple fibre by four-fifths.

Defects of Nylon

Three disadvantages of nylon, one of the foremost of the synthetic fibres, were pointed out by Mr. B. Sutcliffe, of Courtaulds, Ltd., in a talk on "Man-Made Fibres." He observed that it was difficult to dye, it deteriorated on exposure to light, and was easily stretched with a light load, giving fabric distortion.

Mr. Sutcliffe, who was addressing a joint meeting of the Keighley Textile Society and the Yorkshire section of the Textile Institute, also referred to orlon, a fibre practically complementary to nylon, and described the increasing applications of protein fibres.

END OF MOLASSES CONTROL

Control of distribution of molasses will end on April 1, after which there will be reversion to private trade in all grades. Molasses came under Government control in September, 1939, and since the beginning of 1940 all supplies in this country have been Government-owned.

ECA Supports Oil Purchases

Approval has been given by ECA for purchase by Britain of $13 million worth of crude oil and petroleum products, of which $2 million is to be spent in U.S. possessions, $7.5 million in Latin America, the Dutch West Indies and Trinidad, and $3.5 million in the Middle East.

Basic Chemicals in December

Improvement in Stock Position

THE general level of stocks of basic chemicals and non-ferrous metals in December last showed an improvement over the same month of 1948, except in respect of molasses and industrial alcohol, which were considerably reduced.

Production remained fairly steady and there were increases in the consumption of sulphur, ammonia, and liming materials.

Estimated numbers employed in the chemical and allied trades in December (in thousands) totalled 444.4, which was only slightly lower than the previous month, but showed an increase of 16.1 over December 1948. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 255.8 (187.8 men, 68.5 women); paints and varnishes 38.2 (27.0 men, 11.2 women); oils, greases, glue, etc., 67.4 (53.7 men, 13.7 women); pharmaceutical, toilet preparations, etc., 83.0 (42.3 men, 40.7 women).

These figures and the table given below are abstracted from the *Monthly Digest of Statistics*, No. 50.

	December, 1949 Thousand Tons			December, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	151.2	—	—	138.4	136.0	—
Sulphur...	—	27.9	87.1	—	24.4	66.1
Pyrites	—	20.4	84.0	—	20.6	68.0
Spent oxide	—	17.0	179.3	—	17.2	169.2
Molasses (cane and beet)	57.7	24.2†	260.6	59.2	25.5†	278.0
Industrial alcohol (mil. bulk gal.) ...	1.78	2.35	1.83	1.83	2.39	7.89
Ammonia	—	7.01*	5.57*	—	6.61*	5.95*
Superphosphate	18.5	16.3	—	18.1	15.9	—
Compound fertiliser	142.1	105.8	—	141.3	111.9	—
Liming materials	—	524.6	—	—	453.1	—
Nitrogen content of nitrogenous fertilisers	22.76	20.6	—	20.80	20.48	—
Phosphate rock	—	82.0	198.5	—	94.3	161.2
Virgin aluminium	2.56	14.1	—	2.68	16.3	—
Virgin copper	—	25.6	129.7	—	29.5	120.7
Virgin zinc	—	19.0	61.6	—	18.0	46.7
Refined lead	2.19	14.0	51.4	3.46	15.7	20.0
Tin	—	2.19	—	—	2.25	19.2
Zinc concentrates	—	—	73.0	—	12.7	30.3
Magnesium	0.43	0.41	—	0.59	0.44	—
Pig iron	187.0*	135.0	526.0	178.0*	133.0	279.0
Steel ingots and castings (including alloys)	305.0*	—	1,275.0	289.0*	—	1,029.0
Rubber: Reclaimed	0.43‡	0.44‡	2.27	0.46	0.44	4.25
Natural (including latex)	—	4.39	39.2	—	7.06	50.5
Synthetic	—	0.04‡	1.19‡	—	0.05	2.06

* January. † Distilling only. ‡ Average of five weeks.

U.K. Lead Price Reduced

THE reduction in price of U.K. lead by £9 a ton to £88, announced last week, brought the domestic cost of the metal down to its pre-devaluation level.

When sterling was devalued last September the price was advanced to £122, then reduced by stages to £97, at which price it had remained since the last week in November.

The Ministry of Supply has recently had little or no occasion to buy dollar lead, as marginal needs have been met by supplies from Germany and France.

It is felt in many quarters that the time has now come when a London market in lead could be started without loss of hard currency to this country and might well help to establish genuine international values. (*New lead chemical prices: page* 417)

Italian and Spanish Mercury

NEGOTIATIONS for a new mercury marketing agreement between Italy and Spain are now proceeding. A previous agreement assigns 55 per cent to Italy and 45 per cent to Spain, but a larger share is now claimed by Spain on the plea that it is the largest potential producer of mercury in the world. The cinnabar beds at Almaden alone are stated to be good for over 5 million tons of ore, thus placing Spain in a position to supply the needs of the whole world in mercury for the next 50 years.

In 1938 the output at Almaden reached 150,000 bottles of mercury. The Italian mines in Tuscany could provide 50,000 tons of mercury yearly, but they are not fully exploited. Other producers of importance are the U.S.A., Russia and Mexico.

U.S. ALKALI PROCESSES

New Treatments of Chlorine, Caustic Soda and Lye

A NUMBER of newly developed processes for the production and refining of alkalis were described and discussed at a recent Houston (Texas) regional meeting of the American Institute of Chemical Engineers.

The development work to increase the efficiency of electrolytic cells for the manufacture of chlorine and caustic soda was discussed by Deane O. Hubbard, project engineer of Hooker Electrochemical Co., Niagara Falls, N.Y. The trend in the design of cells has been in the direction of larger units, he said. While the early cells were designed for 1000 to 1500 ampères, one French company is now starting a plant with 50,000 ampère mercury cells, believed to be twice the size of the largest cells in operation in the U.S.A.

Mr. Hubbard and his associates have evaluated the Hooker Type S cell in comparison with both smaller and larger cells. It was found to be more economical to use the Type S cells, at 8000 to 10,000 ampères, in plants as small as 5 tons capacity per day than to use smaller cells. Their results also indicated that in plants of 50 tons per day and larger a 20,000 ampère cell could be more economical than a 10,000 ampère cell.

Using Waste Gas

A newly developed process which produces chlorine without caustic soda was described by Mr. Charles P. Roberts, who is connected with the Westvaco Chemical Division of Food Machinery and Chemical Corporation, South Charleston. The new process, he said, would use waste or surplus hydrochloric acid gas as the raw material and would yield a high-purity chlorine gas as the product.

Mr. Roberts described the process as being superior to other currently known methods for recovery of chlorine from hydrochloric acid in several respects, notably those of purity of product and economy of operation. Other methods, however, also are being studied. The process, in its most practical form, he said, consists of the electrolysis of cupric chloride to produce chlorine gas and cuprous chloride. The cuprous chloride thus produced is then oxidised by hydrochloric acid and oxygen to produce more cupric chlorine, which is returned to the electrolysis step.

A recent process for refining caustic soda, or lye, was described by Walter L. Badger. A common method of making solid lye is by drying a 50 per cent solution with the aid of steam heat at moderate temperatures. Badger and his collaborator, David J. Pye, indicated that the new process consists of evaporating the 50 per cent solution to near-dryness at a temperature of about 700°F., using Dowtherm vapour to supply heat.

The principal problems which had to be met, they claimed, were corrosion of equipment and contamination of the lye product. By chemically treating the 50 per cent solution to remove impurities and then evaporating in equipment made of nickel they were able to make a product of high purity without excessive corrosion.

The practical possibilities of the process for large-scale production have been demonstrated in a small plant producing continuously at the rate of 60 tons per day.

Robert M. Crawford, consulting engineer, of Buffalo, N.Y., described the application of the old Deacon process to new methods for producing chlorinated benzene, which is later converted to phenol. Normally, he said, when chlorine is added to organic chemicals like benzene, hydrochloric acid is formed as a by-product and half the chlorine is lost. By use of the old Deacon process, the by-product hydrochloric acid can be converted back to chlorine with the use of air.

These reactions are now carried out in a single step by passing chlorine, air and the benzene through tubes containing newly developed catalysts, which permit operations at temperatures below 500°F.

Advances at Cornell

THE New York Cornell Laboratory has revealed an important refinement of microchemical analysis, developed by Dr. G. H. Ellis (Plant, Soil and Nutrition Laboratory). Depending upon the reaction of cobalt and nitroso-cresol, the method gives a brilliant purplish brown effect in the ultra-violet range by colorimetry and permits the determination of cobalt when it represents only one-thousandth of a microgram in about 5 g. of water.

Another important development at Cornell has been the adoption of a synthetic resin exchange absorption process which is stated to produce better "distilled water."

New Zealand's Chemical and Mineral Industries

A Potential Market for British Products

THE development of New Zealand's mineral and other natural resources and of her manufacturing industries, including chemical fertiliser, pharmaceutical and plastics production, are among the subjects dealt with in "Economic and Commercial Conditions in New Zealand," by Mr. R. Boulter, formerly U.K. senior trade commissioner in that Dominion (HMSO, 8s.). The small to moderate production quantities recorded suggest there is further scope in New Zealand as a potential market for British chemical, and in some instances mineral, products.

Steel Plans

The establishment of an iron and steel industry based on the deposits of iron ore (limonite) at Onekaka, in the northwest of the South Island, was one of the items in the scheme for industrial expansion prepared by the Government before the war.

Early in 1949 experiments were commenced, using an electric furnace, upon the smelting of iron sands of which large deposits exist in Taranaki Province in the North Island. The object was to test the possibility of extracting titanium as well as iron on an economic basis. These tests will include also experiments with deposits of iron sand of a different nature which are found on the west coast of the South Island. In this case the sands consist of mixtures of magnetite, limonite and garnet.

Notwithstanding the lack of indigenous raw materials, the expansion of secondary industries has been an outstanding feature of the economy of New Zealand during the last 10 years. Comparative figures of some chemical productions are:—

CHEMICAL FERTILISERS

	Number of factories	Number of persons engaged	Value of production £'000
1938-39 ...	8	932	1,823
1946-47 ...	9	1,109	2,583
CHEMICALS AND PATENT MEDICINES			
			£'000
1938-39 ...	66	657	668
1946-47 ...	114	1,363	2,324

New Zealand's total output of coal in the first 11 months of 1948 (the latest figures available when the report was written) was 2,555,000 tons. With the development of her manufacturing industries since the war, however, the necessity for increasing imports of coal appears to be indicated. In the immediate pre-war years imports of coal were fairly steady at about 110,000 tons a year, derived almost entirely from Australia. Australian shipments declined in subsequent years and have ceased since 1944. Considerable tonnage has since then been imported from the U.S.A. and South Africa.

Production of pressed glassware in New Zealand, started some years ago, is to be expanded both in volume and in the range of goods manufactured.

Development of the plastics industry has been very rapid. In 1948, eight injection moulding-machines were in operation and over 200 compression presses. Apart from numerous articles of everyday use, manufacture has been extended to electrical switches and fittings, door handles and other builders' hardware, laminated staves for beer casks, garden hose and the fabrication of imported plastic sheet.

In the chemical industries, zinc oxide, white lead, metallic naphthenates for the preservation of timber, etc., liquid driers for the paint and printing ink industries, and preparations for waterproofing cement are all new products. An additional factory has started the manufacture of matches. A large expansion has taken place in the production of toilet and pharmaceutical preparations. Fish liver oils and linseed oil are being made from locally produced materials.

The scope of scientific research undertaken, and the number of organisations engaged in these activities, have expanded considerably in the last few years. A new departure is the establishment of a section of the Dominion Laboratory to study vulcanological chemistry in the thermal regions with a view to the possible utilisation of power from thermal sources.

Imports from U.K.

The total value of imports into New Zealand from the U.K. under the heading of drugs, chemicals and manures in 1948 was £1.8 million, but in few cases were imports of individual items of great importance.

Imports of antiseptics from the U.K. accounted for £91,691 out of a total of £184,182 in 1947, and for £152,172 out of a total of £223,983 in 1948. Competition is encountered from Australia and the U.S.A. Licences for imports are valid for importation from all Commonwealth countries except Canada. They are not, however, valid for imports of penicillin or streptomycin.

Total imports of insecticides and disinfectants were valued at £326,528 in 1947 and £274,767 in 1948. The U.K. supplied sheepdip to the value of £199,348 in 1947 and £134,710 in 1948, the only other imports being small quantities from Australia.

Of insecticides and fungicides for agricultural purposes the U.K. supplied rather less than half the total imports, viz.: £30,826 out of £72,867 in 1947 and £21,217 out of £48,496 in 1948. Australia and the U.S.A. were the other sources of supply. Imports from the U.K. of disinfectants not elsewhere specified, were valued at £12,062 in 1947 and £35,700 in 1948, the total imports in these two years being £17,088 and £45,514 respectively.

The allocations of exchange for 1949 provided for imports on the same basis as for 1948 of sheepdip and weed and scrub killing preparations, and were valid for imports from all Commonwealth countries except Canada. Insecticides and fungicides for agricultural purposes are a "control" item. The import figures include materials for manufacture as well as complete products. There is a small production of sheepdip in New Zealand and a much larger manufacture of insecticides.

70 Per Cent of Dyes

Imports of dyes in manufactured form were valued at £140,446 in 1947 and at £146,531 in 1948. In both years the U.K. supplied 70 per cent of the total imports, followed by Switzerland as the next largest supplier. Part of the trade formerly held by Germany has been secured by Switzerland. Comparative import figures were:—

	1947	1948
	£	£
Total imports of manufactured dyes	140,446	146,531
From U.K.	98,450	108,427
,, Canada ...	12,160	90
,, Switzerland ...	24,289	35,392
,, U.S.A. ...	4,193	1,825

There is no manufacture of dyestuffs in New Zealand and most dyes are imported in manufactured form. Dyers in New Zealand, particularly those in the textile trades, have a predilection for stainless steel vats, with the result that dyes suited for use in such vessels find a readier market.

Imports of other drugs and chemicals into New Zealand from the U.K. include a wide range of both fine and heavy chemicals in comparatively small quantities. They are required as materials for use in a number of industries, e.g., glass, soap, food and aerated waters, pharmaceutical and toilet preparations, electro-plating, welding, plastics, paint and varnish, dairy factories, freezing works, woollen mills, tanneries, etc.

Sodium Products

Total imports of common salt amounted in 1948 to 1,017,000 cwt. valued at £251,981. Of this quantity the U.K. supplied 537,000 cwt. (value, £127,893) and Australia 430,000 cwt. (value, £93,359). The pattern of imports in the previous year was similar. Other 1948 imports of some importance from the U.K. were sodium carbonate, 203,000 cwt. (value, £90,000); sodium sulphide, 36,000 cwt. (value, £50,000); and caustic soda, 37,900 cwt. (value, £48,000). Competition in the supply of chemicals comes from Australia and the U.S.A.

Under the heading of medicinal preparations, which includes drugs, chemicals and druggists' sundries as well as proprietary medicines, total imports are shown as £448,788 in 1948, of which the U.K.'s share was £298,007, Australia £51,515, and the U.S.A. £53,568. Consumption of medicine in New Zealand has been high for many years, and has expanded under the social security scheme which provides medicines free in many cases. A much larger proportion of requirements is now supplied from local manufacture. A number of overseas firms, from the U.S.A. and Australia, as well as from the U.K., have established factories in which many well-known proprietary medicines are now produced and sold under the same trade marks as those in use in the parent countries.

At present, cement for building purposes is very scarce and strict control is exercised over its use. The capacity of the three works in New Zealand is being enlarged with a view to providing sufficient for the country's requirements.

The principal item among imports in the paints and minerals group consists of dry colours which are required as materials by the local manufacturers of paints. Imports of dry colours in 1948 totalled 191,790 cwt. valued at £837,414, of which the U.K. supplied 85,600 cwt. valued at £450,000. Other forms of paint imported from the U.K. in 1948 were white lead ground in oil, 2600 cwt. (value £21,000) and paints mixed ready for use, 2700 cwt. (value £19,000).

Australian Scientific Glassware

Items of industrial scientific glassware which Australia previously imported are now being manufactured in Perth, Western Australia. The range includes stopcocks, specific gravity bottles, pipettes, funnels, nebulisers, condensers, filter pumps and blood transfusion glassware.

MECHANICAL DRYING METHODS

Characteristics of Some Modern Processes

From A CORRESPONDENT

IT is not very long since the majority of drying operations in industry were conducted with home-made driers and by slow and cumbersome processes. It is in fact in the past quarter of a century that drying has entered a new era. No longer is it a primitive necessity appended to other processes, but an operation with economic importance in its own right.

Cause and Effect

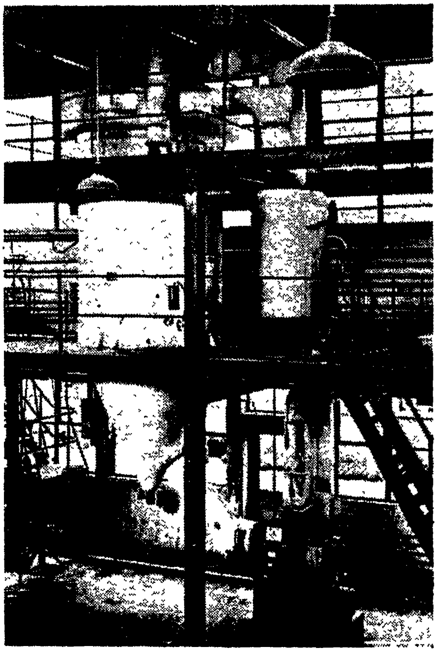
Drying is required for many reasons. The obvious ones are the reduction of weight and volume that follows moisture removal, the greater biological stability of many organic or natural materials when stored in dried forms, and the removal of solvents from main products or from residues after extraction operations. The removal of moisture from materials will in many cases give them more suitable physical properties for consumer-uses; certain waste organic materials, for example, become suitable conditioners for compound fertilisers when naturally associated moisture is removed.

Most drying operations are concerned with the removal of water rather than of other liquids, and the overwhelming majority are based upon evaporation, of which the spray pond and the solar salt pan of the Far East are the large-scale examples. Among the several alternatives, absorption, using a deliquescent solid as the agent, will remove water from immiscible liquids, will serve to dry gas or air, and is occasionally valuable in conferring a " dry " physical condition upon materials which could not be heat-dried. Inconveniently wet chemicals can be brought to a dry state by mixing with anhydrous sodium sulphate, into which the free water passes as water of crystallisation. This obviously can be applied only where the anhydrous agent is an inert and permissible adulterant of the end-product.

Variety of Processes

Adsorption methods of removing moisture have made great use of silica gel and activated alumina for gas and air drying.

Freeze-drying—refrigerative cooling or freezing—of gases causes moisture condensation as droplets which are separated by mechanical means; liquids such as fruit juices lend themselves to a similar process, the ice crystals being removed by mechanical means, such as centrifuge spinning.



[Courtesy, Bamag, Ltd.

Spray drying plant for soap powders

The main drying methods are, however, still based upon evaporation. The engineering tendency to-day is away from standard or universal types of driers and towards the development of drying plants specially designed for particular tasks.

A number of factors have to be considered in designing a drying process. How much heat treatment—for how long and to what temperature limit—will the material stand without impairment of essential qualities, *e.g.*, taste, colour, nutritional trace values, or chemical composition? What is the state of subdivision of the material? Does it become sticky during the drying process? How much moisture must be removed for the drying operation to achieve its purpose? Is batch or continuous drying required? What is the refinement value of the drying operation worth What fuels or heat-sources are available? What are the general atmospheric conditions in which the drying plant will operate?

Where the material is not heat-sensitive up to moderate steam temperatures, the old standard driers still operating in many factories can be employed. Here the material is "paddled" through a fixed steam-heated cylinder by moving arms and vanes. The rotary kiln type of drier is partly a development from this older type. Here the cylinder itself revolves. It is usually slightly inclined. Hot air and gases pass through the cylinder while the product moves more slowly through it.

This type of drier is awkward to use for materials which tend to stick to the sides, or for very bulky materials. The length of such drier, their inclination and speed of rotation, and the rate of feeding the product depend upon the drying "load." The drying power of the hot gases, from a furnace or air-heating plant, has to be limited by the permissible temperature for the product; but some flexibility of drying power can be secured by adjusting the speed of the fan pulling the gases or air through the cylinder.

Simple Method

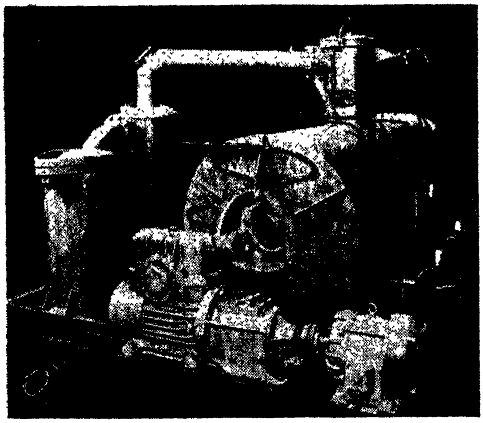
Another well known class of driers is the simple cabinet type. An insulated container with shelves is loaded with trays holding thin layers of the product. Heat is supplied by steam coils, electric units, or the circulation of flue gases, etc. The heat system again necessarily depends upon the tolerance of product, and where a sensitive upper limit or upper range exists, thermoplastic control devices are required. Essentially a batch drier, this type of plant is suited to materials which are produced at hundredweight rather than ton rates.

Modern Developments

The principle has been expanded, however, and continuous operation is possible with the tunnel drier and the moving belt drier. In tunnel driers rack of trays are loaded at one end of the drier and removed dried at the other; the moving belt drier substitutes a suitable continuous belt for the tray and shelf or rack system. In general, the cost of moisture removal, compared with other drying systems, is low for these modifications of the cabinet type drier.

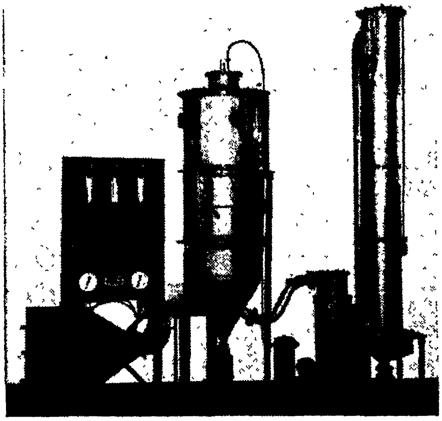
Vacuum drying or drying at low pressure is the common practice when the material is heat-sensitive, and for liquids the ordinary vacuum evaporators of the batch or continuous climbing film type are widely used. Shelf and tray cabinet driers of a "vacuum" type are used for solid materials; the heat supply is commonly provided by transfer through the hollow bottoms of the trays. The vacuum and the removal of the evaporated water is maintained by a powerful pump and condenser system.

The initial and running costs of this type of drier are high and only relatively costly materials, such as pharmaceutical or refined food products, can be economically dried in them. It is said that moving



[Courtesy, W. J. Fraser & Co., Ltd.

Mild steel, horizontal, steam-jacketed vacuum drier



[Courtesy, Kestner Evaporator & Engineering Co., Ltd.

Laboratory size patent spray drier No. 2 with compressed air atomisation belt and tunnel driers of a vacuum type can be expected as future commercial plant developments.

Another prominent class of drier, the spray drier, owes its early development to the dairy industry. In a sense, the method might be called "flash drying." An atomised solution or suspension or even a slurry is projected downwards into a large vertical container where it meets streams of hot air or gases. The droplets are rapidly dried and fine particles, the size of which can be fairly closely regulated, fall to the bottom or are collected in the cyclone of the exhauster air outlet.

The spray drier is ideally suited for producing re-constitutable dehydrated products for the physical condition of the particles produced is excellent. High vacuum freeze drying is usually applied to such materials as blood plasma and pencillin but in Denmark the spray drying technique has been developed so that it may be operated under sterile conditions for these materials.

Roller or drum driers can be used either at normal pressures or under vacuum, producing a flaky end-product. The principle is the carrying of a thin film of the liquid solution, slurry, or paste on the surface of a slowly rotating and internally heated roller. The film gradually becomes solid and is scraped off by a fixed knife edge. The speed of rotation must be set so that the solidifying film is not kept on the heated roller any longer than is necessary to attain a suitable dried condition.

A two-roller system, in which the rollers rotate in opposite directions, and the liquid is fed into the V-trough formed between the rollers, is one of the commoner forms of this type of drier. Roller driers have been operaed for many years, especially in the paper, soap flake, and milk products industries. It is possible to enclose roller-drying in high vacuum containers, but on the whole this adaptation has proved costly both in outlay and operation.

A fairly new type of continuous drier consists of a vertical series of circular trays rotating on the same central shaft. Stationary arms move the material from the centre of the tray to the perimeter, and, on the tray below, from the perimeter to the centre, and so on in alternate series. Thus the material descends from tray to tray. Hot air is supplied from the centre and is fan-controlled, but each tray acts as a baffle; the distribution of moving hot air over each tray is therefore very even. This system dries wet materials efficiently for a fresh surface is exposed each time the product drops to another tray. It is a further reminder to drier designers of the critical importance of maximum surface exposure in securing economical drying.

£169,000 Crown Grant for Anodising Processes

A PAYMENT of £169,000 has been made by the Crown to Alumilite & Alzak, Ltd., for inventions and secret processes used during the war for the protection of aluminium and aluminium alloys, particularly in the construction of aircraft. The award has been made without reference to the Royal Commission on Awards to Inventors.

The Ministry of Supply Patents Branch in its letter to the firm described the award as being for "techniques and processes and information generally known as 'know-how'." Mr. A. J. Milne, managing director of the company, has since stated that the award recognises the firm's co-ordination of available information, much of it before the war. He recalls that there was no one individual "inventor."

The management caused the inventions of several people to be brought together under the auspices of the company and during the war made the collated information available to the Crown.

The processes are anodising and ancillary treatments and at the beginning of the war they are stated to have prevented a serious hold-up of production by enabling industry to do without imported chromic acid.

After treatment, the skin of the aluminium is an oxide which chemically is identical with a sapphire and can be made so hard that it will cut glass.

The 16 patents made available to the Crown and used by thousands of Crown contractors were these: Sulphuric glycerine anodising, black dyeing, boil seal, nickel seal, nickel and cobalt seal, photographic images, sulphuric acid anodising, colouring with permanganic acid, impregnation with corrosion inhibitors, air agitation, boil seal after dye with corrosion inhibitors, sulphuric and oxalic anodising, photographic scales, boiling dye bath, weight controlled anodising, anodising pistons.

MODIFIED TERPENE RESINS

Special Suitability for Printers' Inks

From A SPECIAL CORRESPONDENT

INCREASING attention is being given to the uses of modified terpene resins in printing ink formulations. These resins include such products as rosin-derived alkyds, modified esters of rosins, glycerol esters of rosin, maleic alkyd-modified rosin ester, pentaerythritol esters of rosin, resinous terpene polybasic acid and terpene modified phenolics. The last are the latest additions to the range and they are of great value for extremely fast drying inks.

These terpene phenolics provide the ink manufacturer with the further advantages of light colour, high uniformity from batch to batch and increased speed of incorporation in vehicles. For heat-set inks the phenolics are available with a high melting point, low viscosity, excellent solubility in petroleum solvents and, moreover, they possess a fast solvent release.

Good Oil Solubility

Special terpene modified phenolic resins are being made for use with lithographic inks. Their high viscosity makes them useful in bringing low viscosity oils up to litho varnish viscosity. Good oil solubility eliminates the necessity of high temperature cooking. Their high melting points ensure a fast dry.

Rosin-derived alkyds are water-white, balsamic solid resins having a softening point (Hercules drop method) of 56° C. and a specific gravity at 25° C. of 1.020. These resins can be used in combination with non-drying, oil-modified phthalic alkyds. They are compatible with nitrocellulose, ethyl cellulose, polyvinyl chloride and natural and synthetic rubber.

Their advantages include alcohol resistance, solubility in ordinary lacquer solvent and a resin partly self-plasticised in its synthesis.

Modified esters of rosin suitable for printing ink formulations are pale, hard, tack-free solids. They are soluble in aromatic and aliphatic hydrocarbons, esters and isopropyl alcohol. Although essentially made for use in nitrocellulose lacquers, the modified esters of rosin find important applications in many types of printing inks.

The glycerol ester of rosin is a pale coloured resin possessing good solubility in aromatic and aliphatic hydrocarbons, esters, ketones and carbon tetrachloride. It is miscible and compatible with many film-forming resins and rubbers. A high grade ester gum manufactured by Hercules Powder Co., Ltd., has an acid number of 7, specific gravity of 1.095 at 25° C. and softening point 91° C.

Adhesive Qualities

Maleic alkyd-modified rosin ester is a hard, pale-coloured resin which when compounds with film-forming materials or drying oils produces hard, glossy finishes with good adhesive qualities. It is readily soluble in aromatic hydrocarbons, ketones and esters and all drying oils.

Modified pentaerythritol esters of rosin are well known all-purpose resins for the varnish trade. Typical esters have an acid number of 15; 0.64 per cent free hydroxyl; iodine number 169; thiocyanate number 42 and softening point (ring and ball method) 128° C.

In the preparation of varnishes they are most useful with soft oils or mixtures of soft oils and tung oil and they can be used with long oil alkyds to improve hardness, wash resistance and stability.

Common Requirements

The requirements of resins to be used in printing ink formulations vary from type to type, but some of them are common to all and can be generally summarised as follows:—

1. Light or pale colour: dark resins interfere with ink making and are suitable only for newsprint, where the chief quality of an ink is extremely fast drying.
2. Uniformity of quality: this is of considerable importance as printers work to a tight schedule and a great deal depends on the speed of drying. Variations can cause serious dislocation of work.
3. Low acid number, so that resins have the minimum effect on reactive pigments.
4. Good solubility in oils and petroleum solvents and fast solvent release.
5. High melting point to ensure a fast dry ink.

DIHYDROSTREPTOMYCIN

Some Advantages Over the Parent Substance

INFORMATION published recently on the progress of British streptomycin (THE CHEMICAL AGE, 62, 251) is supplemented by the release this month of a booklet, " Streptomycin and Dihydrostreptomycin," by Glaxo Laboratories, Ltd.

Some notes on the production of the latter substance explain that dihydrostreptomycin is prepared synthetically by the catalytic reduction of streptomycin. Like the parent substance, dihydrostreptomycin is a base capable of forming salts, of which the hydrochloride and sulphate are the commonest.

Considerable importance would appear to attach to the company's claim of lower toxicity of dihydrostreptomycin. There is, it is stated, a growing amount of evidence that this chemical modification of streptomycin considerably reduces the drug's toxicity, without altering its antibacterial activity or its therapeutic efficiency.

Thus, by using dihydrostreptomycin the ordinary course of treatment may be prolonged and the dosage increased without neurotoxic symptoms appearing. It has been stated that a total course involving as much as 90 gm. of the drug can be injected in some cases without vestibular dysfunction occurring.

When dihydrostreptomycin was first introduced, intrathecal administration of the compound was not recommended. It is, however, apparently safe, states the report, to administer dihydrostreptomycin sulphate by the intrathecal route in doses of 25 to 50 mg and it has recently been given intrathecally in full dosage without any untoward effects. These findings apply only to the sulphate and should not be taken as applicable to the hydrochloride until more information about that compound has been obtained.

Mixtures of streptomycin (calcium chloride complex) and dihydrostreptomycin sulphate are chemically incompatible, as insoluble calcium sulphate will be formed. For this reason, after either compound has been used intrathecally a change to the other should not be made without the lapse of sufficient time to allow the first to disappear from the cerobrospinal fluid.

Dihydrostreptomycin sulphate appears to cause less pain on intramuscular injection than does streptomycin (calcium chloride complex) and this is attributed more to the absence of calcium chloride than to the nature of dihydrostreptomycin itself.

Both compounds have, with a few important differences, similar properties; they are equally potent and stable and are effective against the same range of organisms. Unfortunately, bacterial resistance to both drugs is said to be acquired with equal facility; development of resistance to the one involves simultaneous development of resistance to the other.

Natural Gas Source of Canadian Sulphur ?

CANADA could become nearly self-sufficient in sulphur if Alberta allows the export of natural gas to the Pacific coast, it is contended in a brief submitted to the Alberta Petroleum and Natural Gas Conservation Board. The board, in Calgary, is hearing an application to permit the carriage of gas from Westcoast Transmission Co., submitted by Alberta Interfield Gas Lines, Ltd., which proposes to build a grid system to connect various Alberta fields to the gas outlets.

The brief observes that two of Alberta's largest potential export fields—Jumping Pound, near Calgary, and Pincher Creek in the southern foothills—produce gas containing hydrogen sulphide.

It proposes that sulphurisation plants should be constructed to use the sulphur in the waste hydrogen sulphide gas. It estimates annual production would be 243,000 tons.

In 1947, Canada imported 353,000 tons of sulphur from the U.S.A.. It sold on the eastern Canada market at $20 a ton. The company's proposals indicate that the average production cost in Alberta would be $2.48 a ton and even with freight rates ranging from $5.42 to $16.40 a ton, Alberta sulphur could compete on the eastern market.

Alberta has plenty of gas for export, Dr. T. A. Link, formerly chief geologist for Imperial Oil, Ltd., told the board. He said in five years Alberta will have proven reserves of 10 trillion cu. ft. of gas. "Less than half that amount would do the Pacific coast for the next 30 years."

MECHANISED PLANT OPERATION

Advanced Applications for Grease and Lubricants

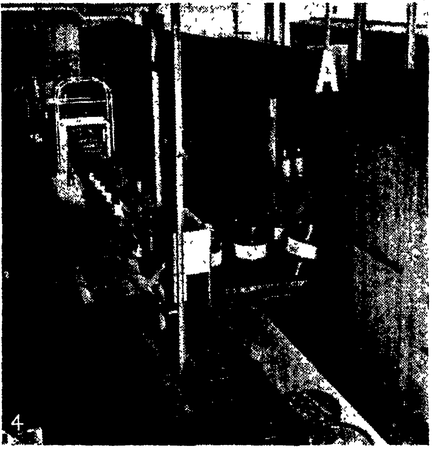
PROBABLY the most advanced application of the principle of securing unimpeded flow of processing, packaging and dispatch in an industry closely related to chemical production is represented by the grease plant recently opened by the Standard Oil Company of California. The installation, at Richmond, California, comprises under one roof (7½ acres) equipment to produce 38 million lb. of lubricants per year and 1½ miles of automatic conveyors which can handle 7600 barrels every eight hours. Lubricants, processed at three levels making full use of gravity feed, are pumped to portable filling and weighing machines, moved on gravity or power rollers and mechanically crated and loaded. Automatic action characterises most departments and labour requirements are smaller than those of any plant of comparable size.

(1) *The filling of 14-gal. oil drums by weight control*

(2) *Dispatching drums by roller conveyors*

(3) *A single operator controls the whole conveyor system, the press buttons operating counters and recorders*

(4) *Drums at the railway dock are mechanically loaded into wagons*



Noble Metal Catalysts

All-Round Efficiency of Rhodium-Platinum Alloys

THE activity of the platinum group of metals and silver in promoting oxidation and reduction processes has been recognised for many years, but it was not until the beginning of the present century that the chemical industry became a major consumer of noble metals for use as catalysts.

For some time, large-scale industrial application of noble metal catalysts was confined to contact process sulphuric acid plants. Other industrial processes have since come into use requiring platinum, rhodium, palladium and silver in considerable quantities, and the number and volume of chemical products manufactured by their aid are continually increasing.

Origins

The principal current uses of these catalysts and the forms in which they are prepared for various industrial processes are described in a booklet "Noble Metal Catalysts" just issued, as publication 1680, by Johnson, Matthey & Co., Ltd., London. This usefully summaries the technological background of the development of platinum gauze catalysts and describes the sort of considerations which have helped to create the present highly developed forms.

It recalls that the abundant supply of low-cost pure ammonia resulting from the development of the processes of ammonia synthesis led to a tremendous expansion of the ammonia oxidation industry, particularly in the period 1920-1930, and it is now the source of almost the whole world's output of nitric acid.

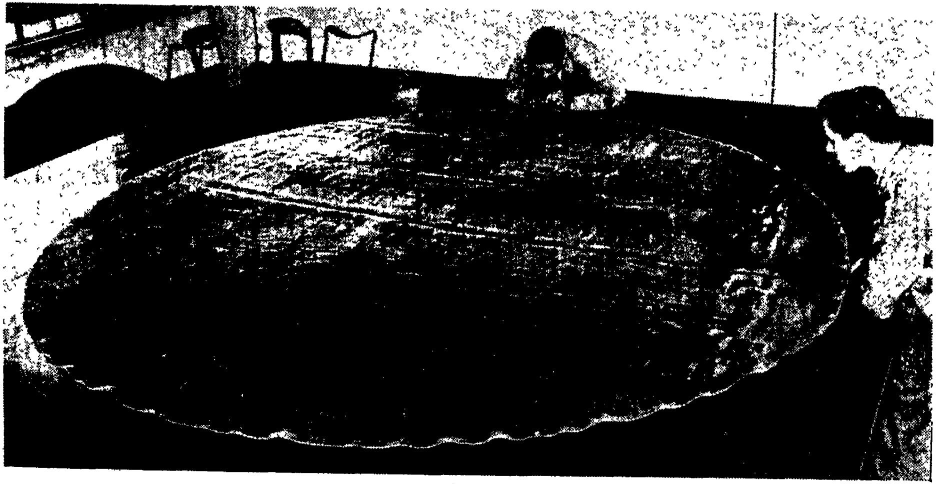
Although base metal oxide catalysts have been brought into use during periods of platinum scarcity, no catalyst as efficient as the platinum gauze pad has been developed, and the process remains fundamentally that which Ostwald devised, in 1902.

The most important modification to the process has been the introduction by the Du Pont Company of oxidation at elevated pressure, usually 6 to 7 atmospheres[1,2].

By this method the conversion of nitrogen oxides to nitric acid is greatly facilitated, but the efficiency of oxidation is reduced, so that to obtain a satisfactory yield it is necessary to work at higher temperatures than in an atmospheric pressure plant.

The increase in operating temperature is accompanied by a reduction in the life of a platinum gauze catalyst, which is very

(*continued on page* 406)



[Courtesy of Johnson, Matthey & Co., Ltd.

The closest scrutiny is given to exclude the possibility of irregularities in the rhodium-platinum mesh catalysts, of which recent examples have been nearly 3 metres in diameter

IMPERVIOUS CARBON PRODUCTS

New Resistant Material for Plant Components

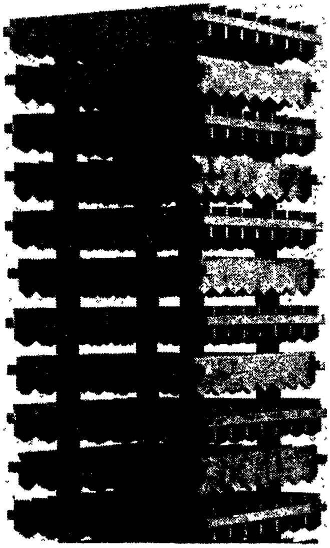
PROLONGED studies of the physico-chemical behaviour of common carbon material have resulted in the development of a new carbon and graphite promising to have wide usefulness for chemical engineering components, where inertness and relatively high mechanical properties are essential.

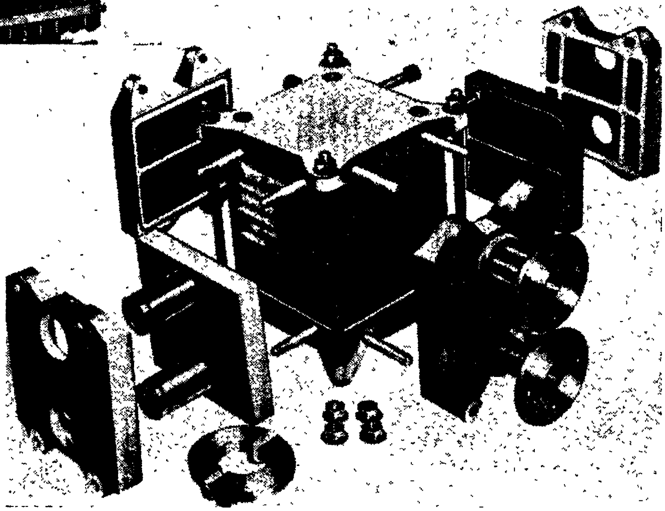
The characteristic of the new materials (Delanium) upon which are based special properties not common to previous carbon products are their homogeneity. The production method disposes of the necessity for an extraneous binder such as used in forming industrial carbon appliances from calcined coke or its equivalent. That method, because of the partial dissipation of the binder during firing, may entail varying degrees of porosities and diminished mechanical strength. Residues of such binders have not carbon's characteristic resistance to high temperatures and chemical attack.

Increased Density

The production of the new carbon and its graphitic form have been described by Powell Duffryn Research Laboratories, which discovered and developed it. The production method, in outline, is as follows:—

Coking coal is very finely ground and to this small quantities of swell-inhibiting materials are added. The mixture is pressed or extruded to the desired form and is fired in a controlled atmosphere in a temperature cycle giving maximum





Right: Components of a cubic heat exchanger, of which the central perforated graphite block combines the corrosion resistance of familiar graphite tubes with very much greater strength. Above: The hard, wettable carbon is used to make tower packing elements formed to provide intimate contact between gas and liquid shrinkage without distortion. After firing, the volume shrinkage may be as much as 45 per cent.

The porosity consequent on loss of volatiles during firing is compensated for by the high volume shrinkage, leaving a final product of low porosity, which, since it consists substantially of carbon-carbon linkages is mechanically strong.

By a suitable choice of coals, swelling-inhibitors, firing atmospheres and temperatures, a variety of Delanium carbons having a wide range of mechanical, thermal, electrical and chemical properties can be produced.

With appropriate heat treatment, this carbon graphitises, as do others, and it is stated that products with a wide range of physical, chemical and electrical properties are obtained.

One of the promising uses made by the Powell Duffryn group of the graphite form is to provide a cubic heat exchanger in which the exchange takes place in a honeycomb carbon block, which dispenses with tubes. Strong and compact, this is stated to be capable of an overall conductance (steam to water) of 500 B.Th.U. sq. ft. hr./F°.

The space economy is implicit in the fact that a conducting area of 50 sq. ft. is afforded by a perforated 15 in. cube of Delanium.

The carbon in a special form has been successfully employed to form a new type of packing for scrubbing and similar towers, chemically resistant and with good wetting properties. Another very appropriate use of the extremely dense carbon is to form tiles to line chemical vats, etc.

Some of the basic characteristics of the two commercial materials are stated thus:

Property	Delanium Carbon	Delanium Graphite
Apparent density (ash-free basis)	1.55	1.70
Electrical resistance in ohm/in.	.007	.0007
Thermal conductivity in B.Th.U./sq. ft./hr./°F./ft. ...	3	40
Transverse strength in lbs./sq. in	12,000	8,000
Compressive strength in lbs./sq. in.	38,000	20,000
Scleroscope hardness	85	65
Coefficient of thermal expansion	3.8 × 10^{-6}/°C.	3.8 × 10^{-6}/°C.

NOBLE METAL CATALYSTS

(*continued from page* 404)

marked under the conditions necessary for high pressure operation.

This circumstance led to the introduction of rhodium-platinum alloys containing up to 10 per cent of rhodium, which have a considerably lower high-temperature loss rate than has pure platinum[3]

At the present time, gauze woven from 10 per cent rhodium-platinum wire is practically universal in high pressure plants. It is arranged in multi-layer catalyst pads of 20 to 30 individual nets, which enable a very large quantity of ammonia to be oxidised in a relatively small converter[4].

The benefits gained by the presence of rhodium in the catalyst diminish as the working temperature is lowered, and in plants working at atmospheric pressure a lower content of rhodium, generally about 5 per cent, is now customary.

While pressure oxidation is extensively used in the U.S.A., Great Britain and Empire countries, it has not been much adopted in continental Europe. Oxidation at atmospheric pressure, sometimes followed by compression of the oxidised gas before absorption, is generally preferred.

In some cases air enriched with oxygen or an oxygen-steam mixture may be employed as the oxidising medium[5]. The search for operational economy and thermal efficiency has led to the use in the atmospheric pressure plants of large diameter burners: 1, 1.5 and 2 metre diameter circular burners are common[6].

Those most recently built have a diameter of nearly 3 metres. In weaving the very large areas of fine mesh gauze of uniform quality needed to clothe these large converters, a very high degree of skill and technical experience is necessary.

Extensive practical trials of both binary and ternary alloys and of gauze of special weave have been carried out in the ammonia oxidation process. The ternary alloys of rhodium, palladium and platinum are probably the most promising[7], but in general the established range of rhodium-platinum alloys, in plain weave, has not yet been surpassed for all-round efficiency, low loss rate and length of effective life.

REFERENCES

[1] "Manufacture of Nitric Acid by the Oxidation of Ammonia." G. B. Taylor, T. H. Chilton, and S. L. Handforth, *Ind. Eng. Chem.*, 1931, 23, p. 860.

[2] "Nitric Acid Production." F. E. Warner, *Trans. Inst. Chem. Eng.*, 1946, 24, p. 118.

[3] "Catalysts for the Oxidation of Ammonia to Oxides of Nitrogen." S. L. Handforth and J. N. Tilley, *Ind. Eng. Chem.*, 1934, 26, p. 1287.

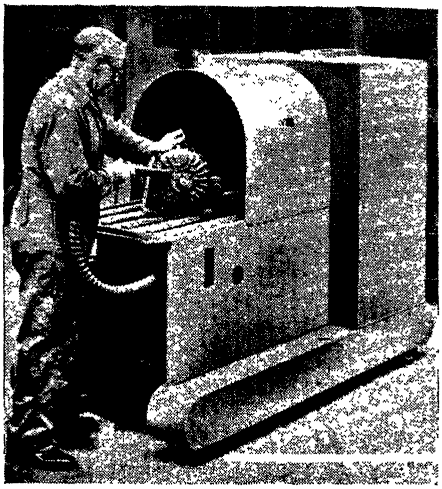
[4] S. L. Handforth and W. E. Kirst, U.S. Pat. 1,919,216 (1933).

[5] "The Production of Concentrated Nitric Acid." A. H. Manning, *Trans. Inst. Chem. Eng.*, 1942, 20, p. 97.

[6] "The German Nitric Acid Industry in the Western Zones." B.I.O.S. Final Report No. 1442.

[7] A. R. Powell, Brit. Pat. 570,071.

Technical Publications



[Courtesy, Dallow Lambert & Co., Ltd.

Problems of dust control confronting maintenance engineers should be simplified by a recent adaptation of the Drymat unit dust collector which draws off the dust by suction instead of the normal " blowing out " method

AUTOMATIC suppression of foam in chemical processes is described in the first of a new series of newsletters now being issued by Elcontrol, Ltd., London, to describe recent applications of its equipment. As soon as the foam reaches a high level probe, the control unit responds and admits a small quantity of the foam-reducing medium by means of a magnetic valve. The foam then subsides, and as soon as it breaks contact with the longer probe the magnetic valve is automatically closed by the control unit.

* * *

DATA on the thermal equilibria of the more important tin-containing binary metallic systems have been summarised in diagram form in a book now obtainable from the Tin Research Institute, Greenford, Middlesex. Needs of the research metallurgist have been borne in mind and a single diagram for each system keeps the information as concise as possible. Diagrams are arranged in alphabetical order according to the element alloyed with the tin, and each is drawn with the percentage of the alloying element increasing from left to right. Supplementary notes are appended, and where available information on the crystal structure is given. Ternary systems are too complex to be adequately represented by one or two diagrams so a bibliography of publications on ternary tin alloy systems is included. The publication has been compiled and produced by L. T. Greenfield and J. S. Bowden.

* * *

REDUCTION of voltage, current and power in a circuit has always been of fundamental importance. The development of constant impedance attenuators and faders to give fine logarithmic control of the output required in transmission networks is described by P. J. Lawson in the January issue of " Technique " published by Muirhead & Co., Ltd., Beckenham.

* * *

A USEFUL work of reference giving practical information about the Belgian chemical industry is the 1950 edition of its directory just published by the Federation of Chemical Industries of Belgium. This describes the organisation of the federation and gives a list of members with their office and works addresses, capital, banking-houses, etc. There are also lists of manufacturers, trade marks employed and a register of products in English, Dutch, German and Spanish.

* * *

THE latest catalogue of its proprietary articles is now available from Evans Medical Supplies, Ltd., as B List (supplementary) January, 1950.

* * *

SOIL building-blocks stabilised with a pectate derived from sisal, developed at the Bulstrode (Bucks.) laboratories of the A.S.P. Chemical Company, and how they are made to conform with the walling requirements of huts for use in tropical and sub-tropical climates, form the basis of an article in the March issue of *The Times Review of Industry* (4, No. 38, 29). Stabilised blocks, placed in trays containing 1 in. of water and sprayed with a hose for several minutes, were stated to be entirely unaffected. As the result of this experiment it was decided to make blocks for the walls of a demonstration hut similar to a type designed by the United Africa Company. The roof (aluminium purlins with a covering of 26 gauge sheeting) was provided by the British Aluminium Co., Ltd.

The Chemist's Bookshelf

THE STORY OF ATOMIC ENERGY. Frederick Soddy. London, Nova Atlantis. Pp. viii-136. 20s.

This book has a much keener appreciation of the dramatic values than most other treatments of the subject. The author claims that he is the sole surviving participator in the origination of the discoveries and ideas which culminated in the bomb and he does not fail to notice the contributions which he made himself to these studies. The whole presentation is forthright and opinions are offered without diffidence. The policy greatly enlivens the clear account of the development of atomic and molecular theories leading up to the discovery of atomic energy.

Prof. Soddy has aimed to make comprehensible to non-scientists a moderately detailed account of the work which led up to some understanding of nuclear structure. He deals with the development of quantum theory, discovery of the nucleus, discusses the significance of the periodic table and thus leads up to the first artificial transmutation. Recalling the circumstances of the manufacture and use of the bombs, he makes a further small contribution to terminology. Once the atomic energy has been set free in quantity, he points out, it is no longer "atomic." It is an-atomic—or to avoid confusion with a biological term—simply "tomic." And this term he uses consistently to describe atomic energy, after its release. The author's acceptance of the "free dissemination" of knowledge theory is complete. Proposals by U.S. scientists for total abolition of war also receive his endorsement.

The book is a replica of articles which first appeared in *Engineering* during 1947 and 1948. Not having been revised, the periodic table given on p. 20 still contains gaps for elements which were announced during 1949. These are the "synthetic" elements not confirmed in nature, but definitely confirmed as present in the uranium fission products (*e.g.*, technetium, No. 43, astatine No. 85 and francium No. 87). The preface, which is, of course, new matter, is incomparably less irritating to read than the main body of text. The whole represents an interesting account for chemists, but the author is probably optimistic in assuming it is intelligible to the general public.—I.B.

THE ART AND SCIENCE OF BREWING. C. A. Kloss. 1950. London: Stuart & Richards. Pp. x + 121. 12s. 6d.

Given here is primarily a concise account of the materials and processes of brewing, written with a minimum of technical elaboration and providing a clear reflection of the current use of science and the scientific method in the understanding and control of brewing. Beginning with a brief history of beer, it deals in 11 chapters with many new aspects of this very old industry. Included are a summary of the activities of research organisations, and biographies of international scientists whose work had a vital influence on brewing technique and scientific development. There are many instructive plates and a bibliography and index.

"Serendipity" and the Scientist

HOPE that the research programme launched by the brewing industry might add not only to results of practical use to the industry but also to basic scientific knowledge were expressed by Sir Edward Appleton at the 29th annual dinner of the Scottish section of the Institute of Brewing held in Edinburgh last week.

The principal of Edinburgh University said that it was a prudent decision to plan long-term research, but he also hoped that the work of their scientists might be characterised by "serendipity." This word, coined by Horace Walpole, meant "the faculty of making happy and unexpected discoveries by accident."

The need for getting new ideas into the industry was emphasised by Mr. M. V. Courage, president of the Institute of Brewing, and particular reference was made to the establishment of the Chair of Brewing and Industrial Fermentation in the Heriot-Watt College (THE CHEMICAL AGE, 62, 274).

· PERSONAL ·

A WIDNES student, **Mr. Charles Vowles**, aged 26, is one of the 50 selected engineers from Great Britain to visit the U.S.A. for special training under the ECA technical assistance programme. Mr. Vowles is taking a two-year course in chemical engineering at the Institute of Chemical Engineering, Massachusetts. He graduated at Liverpool University in 1944, when he was awarded the William Rathbone prize and Carlton Stitt gold medal. He has been released by I.C.I., Ltd., to undertake his present course.

Sir Robert Sinclair, K.C.B., K.B.E., president of the Federation of British Industries, was nominated at the meeting of the FBI Grand Council to serve for a second year in office. Confirmation awaits the annual general meeting of the Federation in April.

Dr. E. H. T. Hoblyn, who has been secretary of the British Chemical Plant Manufacturers' Association since 1944, has been appointed the director of the association, formerly the office of the late Mr. Norman Neville. Dr. Hoblyn has very actively promoted plant manufacturers' interests and has been their emissary overseas on several occasions since the war.

The British Tar Confederation has announced the appointment of the following officers for 1950: President: **Colonel H. C. Smith**; hon. treasurer: **Mr. C. E. Carey**. The executive consists of ten representatives nominated by the Association of Tar Distillers, the British Association of Coke Oven Tar Producers and the Gas Council, with a chairman, **Mr. W. K. Hutchison**, and two vice-chairmen, **Sir Walter Benton Jones** and **Major A. G. Saunders**.

Among the 13 recipients of awards of honorary degrees approved by the Senatus Academicus, to be presented at Edinburgh University at the graduation ceremony in July, is **Prof. E. N. da C. Andrade**, director of the Royal Institution, and formerly occupant of the Quain Chair of Physics, London University.

A research studentship awarded by the Textile Institute in 1947 to **Mr. Philip Ackroyd**, of Doncaster, has been renewed for a further year to enable him to continue research work at Leeds University. Mr. Ackroyd, who is a research chemist at British Bemberg, Ltd., Doncaster, is investigating the spinning and stretching conditions necessary for the production of strong cuprammonium yarns. In a personal item on page 378 of our issue dated March 11, **Mr. R. G. Oversby** was mistakenly stated to have served as hon. secretary of the Textile Institute's Yorkshire section since 1946. He served in that office from 1942 onwards.

Members of the West Riding section of the Society of Dyers and Colourists heard an address in Bradford on March 9 by **Prof. Nils Gralen**, one of Sweden's foremost scientists, on his recent discoveries on the "Cuticle of Wool." Prof. Gralen, who is 38, has been director of the newly-established Institute for Textile Research since 1944, and two years ago was given a professor's chair in textile chemistry at the Chalmers Technical University. His research has been concerned chiefly with the structure and physical behaviour of textile fibres.

The following officers have been re-appointed by the Food Group of the Society of Chemical Industry for the 1950-51 session:—Chairman, **Mr. A. L. Bacharach**; vice-chairman, **Dr. E. B. Hughes**; hon. treasurer, **Dr. J. R. Nicholls**; hon. secretary, **Mr. L. H. C. Barton**. Nominations for five places on the members' committee, vacant owing to retirements, should reach the hon. secretary by March 20.

The board of National Titanium Pigments, Ltd., has appointed **Mr. P. D. O'Brien** and **Mr. B. E. A. Vigers** as managing directors of the company, and **Mr. W. Woodhall**, a director, as general manager.

OBITUARY

Dr. Arthur Dempster, aged 63, atomic scientist, whose name is connected with the discovery of Uranium 235, died at Stuart, Florida, U.S.A., on March 12.

The death has taken place at Bebington, Cheshire, of **Mr. Robert McLean**, formerly secretary of Lever Bros. (Port Sunlight), Ltd.

The death has occurred, at his home in Glasgow at the age of 70, of **Sir Frederick Stewart**, who was chairman of Kelvin, Bottomley & Baird, Ltd., scientific instrument manufacturers, Thermotank, Ltd., and other companies.

PARLIAMENTARY TOPICS

Technology in Universities

PROBLEMS of higher technical education in Britain were debated in the House of Lords on Wednesday, when Lord Calverley, opening the discussion, said that the Ministry of Education should "let people known exactly where the technical colleges stood." There were 27 technical colleges in the country, of which 10 were in the London area, within the ambit of the University of London. It is high time, he continued, that the Government stated definitely that it is prepared to give graduate status to these colleges.

Lord Caldecote agreed that the Ministry of Education should define its proposals, but could not agree with the granting of indiscriminate degrees. Suggestions had been made that the engineering faculties should be removed from the universities. That, he thought, would be wholly misguided.

Lord Darwen (Lord-in-Waiting), replying, said there was no evidence to support the view that our technology training courses were inferior to other countries'. Considerable expansion was needed and some reforms were overdue, although facilities had been increased and the number of technologists trained since the war had been doubled. These colleges were not regarded by the Ministry of Education as Cinderellas in education.

Security of Secret Documents

REPLYING to a number of questions in the House of Commons on the subject of the Fuchs case, Mr. Harold Wilson, President of the Board of Trade, said he thought it unnecessary for him to lay down any special security regulations to cover secret documents, patents, and inventions brought before the National Research Development Corporation. In the unlikely event of such documents coming before the corporation, the normal security arrangements of the departments concerned would be applied. Answering Mr. Baker White, who suggested that Soviet agents had derived a considerable amount of useful information from non-secret documents which came before the Canadian Research Council, Mr. Wilson said that all necessary security arrangements for the corporation had been considered and responsibility must rest with the departments concerned with placing documents before it.

LETTERS TO THE EDITOR

"Sophistication" of Foodstuffs

SIR,—Your article on "Present Trends in Baking Research" in your issue of February 11 surely answers itself. As long as we are not *completely* certain that polyoxyethylene stearate, DDT and other chemicals have not, *in the long run,* toxic effects on the human organism, surely the wise course is to suspend their use until much more prolonged and thorough research establishes their innocuity beyond the shadow of a doubt.

In my own experience as a practical miller I have never found the addition of any chemicals necessary in flour or bread making. The law prohibits sophistication of such foodstuffs as milk and butter, and a good case can be made for the extension of that ban to flour and bread.—Yours, etc.,

C. P. ALLINSON.

The Mill House,
Streetley End,
West Wickham, Cambs.
March 18, 1950.

Standard Measures : Pharmacist's Approval

SIR,—The British Standards Institution, after discussion with the Pharmaceutical Society and the Ministry of Health, have now extended their original specification on measuring cups and spoons to include a standard tea and table spoon for measuring the dose of medicine.

As a pharmacist, may I say how welcome is this recommendation. Apart from the wide difference between the standard cooking spoon and that for medicine, the variation in the size of household spoons, particularly the teaspoon, is considerable and can give rise to inaccuracy of dosage, maybe with serious consequences where a potent drug is concerned.

The public, parents especially, will I am sure appreciate the suggestion of such standardised spoons. I hope that they will soon be available and that every encouragement will be given to use them.—Yours, etc.,

MARY C. ISLIP.

Paddington Green Children's Hospital,
Paddington Green, W.2.
March 10, 1950.

· HOME ·

London Showrooms

Megator Pumps and Compressors, Ltd., have moved their offices and showrooms from Feltham, Middlesex, to 43 Berkeley Square, London, W.1.

Works Fatality

Mr. Thomas Casey, aged 43, of Fernhill Street, Toxteth Park, Liverpool, was killed on March 10 when he fell into a vat of chlorine and water at the African Oil and Compound Mills, 21 Flint Street, Liverpool. Workmates pulled Casey from the tank, but he was dead on arrival at the Royal Infirmary.

Defining Plastic Film Properties

I.C.I., Ltd., has introduced a system of gauge numbers for defining the thickness of Alkathene film. The gauge numbers relate to thickness in thousandths of an inch. Thus, gauge 150 represents a thickness of 0.0015 and yields 20,000 sq. in. per lb.; and, at the other extreme, gauge 1000 is a film of 0.010 in. covering 3000 sq. in. per lb.

Chemical Duty Exemptions

The Treasury has made an order under Section 10 (5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty for the period March 13-June 30, 1950:—*n*-butyl -alcohol, mono chloroacetic acid, dibutyl diethylmalonate (a butyl ester), ethylenediamine, R. phenol synthetic phenol, sodium monochloroacetate (a monochloroacetic salt).

Chemical Society Research Grants

Applications for grants from the research fund of the Chemical Society, for the assistance of research in all branches of chemistry, will be considered in June and should be submitted on the appropriate form not later than May 1. Applications from Fellows will receive prior consideration. Details may be obtained from the general secretary, the Chemical Society, Burlington House, Piccadilly, London, W.1.

Directorate of Scientific Intelligence

The establishment of a Directorate of Scientific Intelligence is provided for in a memorandum published as a White Paper to the Ministry of Defence Estimates for 1950-51. The directorate is described as a development of an earlier arrangement, under which staff engaged in scientific intelligence work were paid by their parent departments, and were associated in the form of a committee. Estimated cost of the directorate is £38,044.

Silica Works Damaged

The power house and generator at the silica works, Pentrefelin, Llangollen, were badly damaged by fire on March 8.

Towards Oil Agreement

Talks between American oil companies and British oil experts on the decision to restrict dollar oil imports are to take place in London at the end of the month, states the Foreign Office.

Small Rise in Coal Output

Coal production in the United Kingdom last week was 4,375,600 tons (4,128,200 deep-mined, 247,400 opencast) compared with 4,333,200 tons in the week ended March 4. Output in the first ten weeks of this year totalled 43,035,100 tons, a rise of 686,900 tons over the same period of 1949.

Standardising Spoons

The British Standards Institution, after conferring with the Pharmaceutical Society and the Ministry of Health, has proposed that medicine tablespoons should hold 1/40th, and cookery tablespoons 1/32nd of an Imperial pint; medicine teaspoons hold 1/160th and cookery teaspoons 1/96th of a pint. These recommendations are designed to permit American and British interchange of recipes.

U.K. Lead Supplies in January

An addition to the January figures of non-ferrous metals (THE CHEMICAL AGE, 62, 364) relating to the summary of lead supplies in the United Kingdom, has been issued by the British Bureau of Non-Ferrous Metal Statistics. No figures were quoted for Government and consumers' closing stocks at January 31. Totals should have been: Imported virgin lead, Government and consumers' stocks: 55,937 long tons. English refined lead, consumers' stocks: 4193 long tons.

Collaboration by Chemists

The relative solidarity of the British Medical Association was quoted as an example of collaboration which chemists might emulate by Mr. C. B. Woodley, general secretary of the British Association of Chemists, speaking at the annual dinner of the Liverpool section on March 6, at which Mr. G. A. Dunn presided. "Nobody orders the doctors around; the Government hardly takes a step without consulting them," remarked Mr. Woodley. The BAC was determined to improve professional conditions and status.

Next Week's Events

MONDAY, MARCH 20

Electrodepositors' Technical Society

London: Northampton Polytechnic, St. John Street, Clerkenwell, E.C.1, 6 p.m. Discussion: "Recent Developments in Bright Nickel Plating."

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 6 p.m. Cantor Lectures. First of three lectures by Colin J. Smithells (director of research, British Aluminium Co., Ltd.): "The Manufacture, Properties and Applications of Aluminium and its Alloys." (Remaining lectures, March 27 and April 3.)

TUESDAY, MARCH 21

Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. H. W. Ashton and G. T. Meiklejohn: "Cost Estimating in Process Development."

Institute of Petroleum

Manchester: Engineers' Club, 6.30 p.m. T. Ellis: "Petroleum in Agriculture."

Incorporated Plant Engineers

Glasgow: 351 Sauchiehall Street, 7 p.m. K. Marwood: "The Use of Electronics in Industry."

WEDNESDAY, MARCH 22

The Chemical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. (with RIC and SCI). Dr. H. W. Thompson: "Some Recent Applications of Infra-red Spectroscopy."

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.15 p.m. (Food Group, Nutrition Panel). "The Nation's Manufactured Foods"—Fourth meeting of series.

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 2.30 p.m. Pope Memorial Lecture. Professor John Read: "Chemistry as an Instrument of Culture."

The Institute of Welding

Enfield: Technical College, 7.30 p.m. W. Mackenzie: "The Application of Welding to Cold-Rolled Steel."

THURSDAY, MARCH 23

The Chemical Society

Liverpool: University, 4.30 p.m. Prof. M. G. Evans: "Photo-excited Electron-transfer Reactions."

The Royal Institute of Chemistry

Dagenham: South-East Essex Technical College, Longbridge Road, 6.30 p.m. R. Slack: "The Chemistry of Some Actinomycetic and Bacterial Antibiotics."

The Plastics Institute

London: Waldorf Hotel, Aldwych Hotel, W.C.2, 6.30 p.m. J. H. Collins: "Protein Plastics."

Mineralogical Society

London: Burlington House, Piccadilly, W.1, 5 p.m. Miscellaneous papers.

FRIDAY, MARCH 24

Manchester Statistical Society

Manchester: Albert Hall, Peter Street, 6.45 p.m. A. Howarth: "Work Measurement."

The Society for Visiting Scientists

London: 5 Old Burlington Street, W.1, 7.30 p.m. Discussion: "Computing Machines and Brains."

SATURDAY, MARCH 25

The Royal Institute of Chemistry

Dartford: 2 p.m. Visit to vegetable parchment mills.

RSA Lectures

AMONG lectures to be delivered at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, is one on March 22, by Dr. John Read, professor of chemistry at the University of St. Andrews, on "Chemistry as an Instrument of Culture." "The Manufacture, Properties and Applications of Aluminium and its Alloys" is the subject of a series of lectures by Dr. C. J. Smithells, commencing on March 20. Mr. Hamid Ali, deputy trade director, Office of the High Commissioner for Pakistan, will speak on "Projected Industrial Development in Pakistan," on April 13, and Mr. W. V. Blewett, of I.C.I., Ltd., will present a paper entitled "Tropical Agriculture" on April 25.

German Exhibition of Chemical Apparatus

The German Chemical Apparatus Society (Deutsche Gesellschaft für Chemisches Apparatewesen) proposes to hold an exhibition in Frankfurt from July 9 to 16, when the products of some 350 German manufacturers of chemical plant, etc., will be on view. Concurrently, meetings will be held by a number of scientific bodies, including the Society of German Chemists and the Chemical Safety Engineers.

◆ OVERSEAS ◆

Malayan Rubber Exports and Stocks

Rubber exports from Malaya during January were 58,780 long tons. Exports in January 1949 reached a peak of 75,568 tons.

92 per cent Titanium

The U.S. Navy's Bureau of Aeronautics has produced, after four years' research, a new lightweight titanium-based alloy, basically 92 per cent titanium, 5 per cent chromium, and 3 per cent aluminium, said to have the strength of steel and great heat and corrosion resistance.

American Chemicals for Austria

The ECA reports in New York that Austria is contemplating buying more than $800,000 worth of chemicals and chemical products and $10,000 worth of non-ferrous ores and concentrates from American suppliers, and $100,000 worth of chemicals and chemical products from Latin American suppliers. Some $300,000 will be spent on coal tar dyestuffs.

New Australian Oil Refinery

The Vacuum Oil Company's new refinery at Altona, Victoria, Australia, has produced its first yield of industrial lubricating oil. The refinery cost £A1 million and it will also provide some of Australia's diesel oil, bitumen and petrol requirements. The crude oil distilled at the refinery comes from the company's field at Klamono, Dutch New Guinea.

Joint Library Service in Chicago

Eleven mid-western universities in the United States are reported by Unesco to have pooled their library collections to form a centralised library at the University of Chicago. Research facilities of the universities, which are normally attached to the libraries are being incorporated into the main centre. Transport of books will be made by air.

Infra-Red Spectroscopy

Recognition of the serious shortage in the U.S.A. of people with sufficient training and experience to make full use of infra-red spectroscopy as a research technique is represented by the decision of the Spectroscopy Laboratory and the Department of Chemistry at the Massachusetts Institute of Technology to provide an intensive course in infra-red methods and applications during the Institute's 1950 Summer Session. It will be confined to workers with several years' research experience.

New Fatty Acids Plant

A plant for the manufacture of fatty acids, stated to be the first of its kind in Schleswig-Holstein, is to be erected in Utersen with U.S. assistance.

World Rubber Situation

The seventh meeting of the International Rubber Study Group will open in Brussels on May 2, when an examination will be made of the world production and consumption of rubber. Thailand and Indonesia are new members of the group.

Chemical Manures in France

Additional plant for the manufacture of chemical fertiliser, which is being installed at the Roche-la-Molière (France) factory of the Compagnie des Produits Chimiques, is expected to be in production by June, and the present average daily output of eight tons will, it is stated, reach 30 tons towards the end of 1950.

Department for Plastic Films

E. I. du Pont de Nemours & Co., has formed a new film department to be responsible for research, production and sales for all products now handled by the cellophane division of the company's rayon department. The new organisation reflects the great expansion since the war of the activities of the cellophane division.

More U.S. Insecticides

A new plant of the Tobacco By-products and Chemical Corporation, Richmond, Virginia, is under construction at Montgomery, Alabama. It is to specialise in the manufacture of insecticides for cotton, peanut, vegetable and fruit crops of the southern States of the U.S.A. and production is expected to start early in April. The by-products company has been a producer of insecticides since 1885 and is claimed to be the world's leading manufacturer of nicotine sulphate.

First Gas-to-Oil Plant

The Carthage Hydrocol Company has announced that it is about to put into operation the first plant for the manufacture of synthetic petroleum from natural gas. The $80 million plant, at Brownsville, Texas, will use the new hydrocol process to treat 75-85 million cu. ft. of natural gas daily. Output should reach 6000 barrels of high octane petrol, 900 barrels of gas oil, 200 barrels of fuel oil, and 300,000 lb. of chemical by-products daily.

Fuel Research Projects in Spain

New Laboratories' Large Programme for Fuels

MUCH attention has been given in Spain in recent years to fuel research and to co-ordination and concentration of the State and private bodies concerned. This culminated in the formation of the Instituto Nacional del Combustible under one of the principal patronatos of the country—Patronato Juan de la Cierva.

This is actually a co-ordinating body controlling several research stations and centres, among which are the laboratories recently opened at Zaragoza for the scientific study of fuels in connection with the Faculty of Science in that city.

This research will be of a basic character although applications are not likely to be disregarded. Prof. Dr. V. Gómez Aranda describes the new buildings and the scope of their work, with numerous illustrations (*ION*, Jan. 1950, pp. 29-34).

The two primary considerations underlying these developments were (a) the importance of fuel research in Spanish economy, including the use of coal both as fuel and as raw material for important branches of chemistry, analogous to those based on petroleum; and (b) the present state of Spanish industrial progress intimately affected by fuel research.

From these points of view, even poor grade Spanish coal, possibly of little value as fuel, and metallurgical coke may be valuable raw materials for chemical industry. The author believes that, save in extreme cases, it will always be possible to apply processes to this end. He appears to be referring specially to the Aragonesian coals. But each distinct type or grade of coal must be thoroughly studied. Among the laboratories' first tasks will be a categorical evaluation, primarily of the coals of Aragon, but later of others.

This evaluation will include all the chemical and physical properties and constitution, results of low temperature distillation, hydrogenation, etc. Such work as has already been done in this large and varied field has shown profound differences, often in coals from the same source, *e.g.*, from the Val de Arino, which include also lignites.

The various departments of this research are briefly discussed under the headings of hygroscopicity, distillation ABT (low temperature), gas purification, semi-coke tests, coal tar research, high pressure hydrogenation—using a Bergius bomb of five litres capacity; sulphur problems, fluid catalysis (Mertens system, Belgium) with plant and methods supplied by Professor Mertens (Louvain University); and hydrocarbon properties. A comprehensive library and information service will be maintained and will be co-ordinated with those of other research centres.

Purchase Tax Exemption

A NEW order, The Purchase Tax (No. 6) Order, 1950, which has been made by the Treasury, re-enacts, with additions, the list of essential drugs and medicines exempt from purchase tax under the Purchase Tax (No. 3) Order (S.I.1949, No. 1529). All drugs previously exempt remain so. Any entries in the old list which no longer appear in the schedule to the new order have been assimilated into more comprehensive entries or re-classified, using the shortened name approved by the British Pharmacopœia Nomenclature Committee. Changes in the order, which came into effect on Monday, have added the following exempted items:—

Organic compounds of copper; plasma substitutes; 1 - Benzyl - 3 - (dimethylcarbamyloxy) - pyridinium bromide; Bis - 3 : 3^1 - (4 - hydroxy - coumarinyl) - ethyl acetate; 2 : 5-dihydroxybenzoic acid, and salts thereof; 2 : 2^1dihydroxy-5 : 5^1-dichlorodiphenylmethane; dimercaprol; hexachlorethane; hexazole; mephenesin; 3-(1-piperidyl)-1-phenyl-1-cyclohexyl-1-propanol, and salts thereof; 2-aminoheptane, and salts thereof; chlorcyclizine hydrochloride; ethers for general inhalation anaesthesia, and mixtures thereof; phenadoxone, and salts thereof; preparations of the substance known as streptokinase, which is produced from a suitable strain of haemolytic streptococcus; isoprenaline; mepyramine maleate.

(*continued at foot of next column*)

Ultrasonic Testing of Welds

THE greater part of the experimental and routine work in this investigation sponsored by the Steel Company of Wales (The Chemical Age, **62**, 335-7) was carried out by Mr. J. W. Fox, whose name was inadvertently omitted from the attributions. The "source of finite diameter" (of the generation of ultrasonic waves) referred to by Mr. E. M. Lewis, was to distinguish this from the point sources used in Mulhauser's method. To secure beaming, the diameter of the source must be at least a few wavelengths.

W. GERMAN PRODUCTION INCREASES

Growing Activity in Chemical Export Markets

DESPITE continuing high unemployment, a seasonal decline in the building and allied trades, an unexpected contraction in exports, and general uncertainty about the economic outlook, production in the West German chemical industry has continued to increase.

The latest statistics, for January, show a rise in the output of sulphuric acid to 87,400 tons (83,200 in December), of nitrogen fertilisers to 40,200 tons (N) (34,600 tons), of phosphate fertilisers to 27,400 tons (P_2O_5) (25,000 tons), of soap to 6140 tons (5112 tons), and of dyestuffs to 2006 tons (1970 tons).

The West German dyestuffs industry has now decisively overtaken France and Switzerland and is again leading in continental Europe.

Of the new trade agreements, that with France is by far the most important for German chemical manufacturers. German ammonia, hydrocarbons, anhydrous phosphorus compounds and sulphur compounds are among products which will be freely admitted into France. Import quotas have been fixed by the French authorities for German calcium carbide, chlorine compounds, urea ($1,500,000), electric fuses, polystyrol, pharmaceuticals ($250,000), and dyestuffs intermediates ($350,000). West German suppliers may also send, among other things, $550,000 worth of pharmaceutical preparations to French North Africa, excluding Algeria.

France will not import from Western Germany penicillin, superphosphates, lacquers, paints, soap, solvents, fatty acid derivatives, sulphuric acid, or synthetic rubber. Western Germany, on the other hand, will not admit French fertilisers, (apart from rock phosphates), tartaric acid or synthetic edible fats.

Only a Beginning

The French-German commercial treaty does not, of course, interfere with the lists of commodities to be admitted freely into France which were published before the end of 1949, and German manufacturers are confident that they will be able to expand their chemical sales to the French market.

Other recent trade agreements also permit of larger chemical exports from Western Germany. Paraguay is to receive chemical products, including photographic films worth $150,000, and $200,000 worth of pharmaceutical products this year. A substantial expansion in exports of dyestuffs and chemicals has been noted in trade with Mexico.

Potash exports from Lower Saxony, where most of the West German production originates, last year realised $7,040,000, almost equally divided between crude salts and processed material. Though export proceeds of the potash industry have been affected by the devaluation of sterling and other currencies, a continued high level of potash exports is anticipated.

Currency Shortages

Exports of rock salt from Lower Saxony, on the other hand, fell last year from 156,000 to 110,000 tons, which were shipped mostly under old contracts. Foreign buyers, it is reported, cannot obtain currency permits, payable in dollars, for West German salt, and devaluation and high transport costs also impair the competitive position of German producers.

The difficulties encountered by West German pharmaceutical manufacturers last year, owing to overstocking by retailers and overestimating of demand, have by now been overcome, but domestic sales are impaired by the economy drive in the sickness insurance organisation, which normally accounts for 70 per cent of the home business.

In the export market sales are affected chiefly by currency considerations on the part of importing countries and competition by foreign subsidiaries of German producers which are using the original trade brands. In some cases exclusive rights to these trade marks have been given to local firms which formerly distributed the German preparations but now sell their own under the branded name. Partly to meet this competition, Farbwerke Höchst have changed their name to " Farbwerke Höchst vormals Meister Lucius und Brüning " and intend to introduce the old " MLB " mark for use abroad.

Rheinische Zellwolle AG, Siegburg (Rhineland), has changed its name to Chemie-Faser AG. The firm states that the term " Zellwolle " (cell wool) has been brought into disrepute by wrongful use, but the change may also be intended to

(continued at foot of next page)

REVIVING GERMAN LACQUER INDUSTRY

Nearing the Pre-War Level of Output

THE output of lacquers in Western Germany in recent months has closely approached the pre-war level. This reverses the situation during and immediately after the war, when the paint and varnish industries were greatly limited by the effects of war damage and lack of raw materials, fuel and power. The effects of war damage were slightly mitigated by the circumstance that the lacquer manufacturers in Germany are, for the most part, small or medium size concerns.

Continuous Growth

The Allied control has, to a certain extent, encouraged production of paint and varnish in order to minimise the ravages of corrosion and other deterioration of buildings and equipment.

Short supplies of raw material, however, continued to be a most serious obstacle, especially of linseed oil. But imports gradually increased, and by the first half of 1948 output of varnishes, etc., were 50 per cent of pre-war; the continuation of that improvement is shown in the table below.

The home market for lacquers is now much smaller, due to the loss of the eastern territory. Most of the production was centred in West Germany, and the east, with little productive capacity, naturally constituted a very important part of the home market. Quality appears to have been maintained, and although costs of production are such that competition in foreign markets is not easily met, there is strong hope that much of the former export trade will be eventually recovered.

Lacquers and varnishes are being made in West Germany by about 500 undertakings, the majority of which are small. Trading conditions are not easy for the smaller men: they often have to grant long credits to their customers, but in return have to pay on or before delivery for their raw materials or equipment.

The main difficulty with which the industry is at grips is its fairly intimate dependence on imported raw materials, largely from hard currency countries. Present estimates suggest this dependence requires the expenditure of some $20 million a year. By developing new methods and formulations it is hoped to dispense with a considerable part of this expenditure.

	Clear Lacquers (Oil)	Synthetic Resin Lacquers	Nitro-Lacquers (Tons)	Oil-free Synthetic Resin	Emulsions etc.	Total
1948	4,003	26,834	17,600	24,403	12,150	97,670
1949 (1st Quarter	1,517	9,742	5,863	6,025	1,043	32,754
1949 (2nd Quarter)	2,532	14,405	5,080	4,612	1,600	35,808
1949 (3rd Quarter)	—	—	—	—	—	41,647

W. GERMAN PRODUCTION INCREASES

(continued from previous page)

pave the way for an enlargement of the production programme, possibly by manufacture of a fully synthetic fibre based on the Furon fibre, on which the Phrix interests have been working. The plant at Siegburg is to be modernised. Its whole output of staple fibre has been sold ahead for a substantial part of the current year.

Petroleum refining operations are being resumed at the Gelsenberg-Benzin AG hydrogenation plant at Gelsenkirchen, in accordance with the Allied permit issued in February. Crude oil will be obtained from the Emsland fields near the Dutch frontier, and an output of 15,000-20,000 tons of petrol, 5000-10,000 tons of diesel oil and 1000 tons of motor fuel per month is expected.

The two hydrogenation plants at Wesseling and Gelsenkirchen should be able to deal with 42,000 tons of crude oil a month, or about half the German production, but in the absence of subsidies, which have not been received for some months, German oil production cannot compete with imported petroleum derivatives.

In Eastern Germany it is reported that the works at Böhlen, Zeitz and Leuna are together producing from lignite 50.000-60,000 tons of motor spirit and diesel oil a month.

The Stock and Chemical Markets

POLITICAL uncertainties and a general tendency in the City to defer action until the Budget is presented (probably on April 18) have diminished interest in the stock markets. British Funds have regained part of earlier declines, but there have been only small movements in industrial shares, despite the announcement of a number of increased dividends.

The view prevails that the Budget cannot be expected to bring any material reduction in the burden of taxation while Government expenditure remains at its present level.

Imperial Chemical were at 41s. 10½d. and the market expects that the company will maintain its dividend at 10 per cent for the past year. Profits may record a good advance. It is also assumed in the City that expansion and development plans may require further capital in due course.

Many leading industrial companies are believed to be in need of more capital, but market conditions, dividend limitation and other factors make for difficulty in raising it on terms attractive to shareholders. Consequently, it is reported, some companies have to augment their cash resources by selling part of their investments in British Funds. This partly accounts for the uncertainty which has ruled recently in the gilt-edged market.

Monsanto Chemicals have remained 51s. 3d., the shares being held firmly because of the good prospects of shareholders receiving more, should the dividend limitation request be removed. Fisons have been steady at 22s. 9d., awaiting the new issue terms. Turner & Newall eased to 76s. 6d. and Lever N.V. were weak at 41s. 6d., owing to selling in Amsterdam. Borax Consolidated (53s.) have been firm; British Glues & Chemicals 4s. shares held at 20s. 3d.; and Glaxo Laboratories 10s. units have been active at 45s. Firmness at 94s. 6d. was shown by British Oxygen, awaiting the financial results.

Triplex Glass 10s. units have been steady at 18s. 6d., but United Molasses (37s. 3d.) failed to recover from their recent reaction. British Xylonite, at 58s. 9d., were inclined to improve and other shares of plastics companies were rather more active, including British Industrial Plastics 2s. shares at 5s. 7½d., Kleemann at 8s. 1½d. and De La Rue 23s. Iron and steels became steadier, but failed to recover from their recent reaction, investors holding off despite the good yields.

Oil shares were undecided, although Anglo-Iranian moved slightly higher on balance.

Market Reports

REPORTS from the industrial chemicals market refer to steady trading conditions and indicate that buying interest for the home consuming industries has been sustained. Overseas inquiries received by merchants and shippers continue on a good scale and are well spread over most sections of the chemical market. The items which are in day to day demand are moving steadily against contracts. Prices generally are unchanged, although a reduction in the controlled price of pig lead has resulted in lower prices for dry white lead and red lead. The new basis prices are: dry white lead £116 5s. per ton; ground white lead £136 10s.; red lead £106 15s.; orange lead £118 15s.; red lead ground in oil £129 15s.; and orange lead ground in oil £141 15s. There have been no important changes in the coal tar products market, although some improvement in export business is reported for cresylic acid and pitch. Toluol, xylol and the naphthas are moving well on a slightly better home demand.

MANCHESTER.—Business on the Manchester chemical market during the past week has proceeded on reasonably steady lines and home-trade deliveries of the principal light and heavy products have in general been on a good scale. There has also been a continued satisfactory movement on export account. A fair amount of replacement buying has been reported by domestic consumers, while shippers' inquiries have also been on a fair scale. The general price position remains firm. Sulphate of ammonia and a number of other fertiliser materials are now attracting some attention, and a steady trade is being done in most sections of the tar products market.

GLASGOW.—The Scottish heavy chemical market has this week shown a definite falling off in orders, and most of the business being done is for immediate requirements; there is a tendency for general reduction of stock orders.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

A. & W. CHEMICAL Co., LTD., London, E.C. (M., 18/3/50.) February 16, £2100 mort. (sec. 97, 1948 Act), to P. K. Metcalfe, Hove, and others; charged on 1 and 2 Cricketers Court, Lower Kennington Lane, Lambeth.

BUTACET, LTD., London, W.C., manufacturers of fermentation products, etc. (M., 18/3/50.) February 18, by order on terms, £2750 mort., to Coalite & Chemical Products, Ltd.; charged on 25 Grosvenor Crescent Mews, S.W.1. *£2651. December 28, 1949.

RENTOKIL, LTD., Fetcham, manufacturers of insecticides, etc. (M., 18/3/50.) February 14, further charge, to Peckham Mutual Building Society securing £400 and further advances not ex. therewith £1700; charged on Dormers Hall (formerly Dormers), School Lane, Fetcham. *£4955. December 20, 1949.

SERVISOL, LTD., Liverpool, manufacturers of chemical preparations, etc. (M., 18/3/50.) February 7, mort. and charge, to National Provincial Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *— April 10, 1949.

New Registrations

Land Pyrometers, Ltd.

Private company. (479,247). Capital £10,000. Manufacturers of all kinds of instruments, materials or equipment used in connection with temperature measurement, in particular with pyrometry, etc. Directors: F. W. Land, "Prenton," Church Lane, Dore, Sheffield; T. Land; E. H. Land.

New Swiss Chemical Company

The A.G. für Commercielle Chemie, Zürich,, has recently been registered with the object of engaging in the wholesale and entrepôt trade in chemicals, dyes and allied products. The share capital is Fr. 1 million.

Increase of Capital

The following increase in registered capital has been announced:—STAFFORD SALT & ALKALI Co., LTD., from £35,000 to £50,000.

Company News

African Explosives and Chemical Industries

Plans to raise £7.5 million over the next two years were announced last week by African Explosives and Chemical Industries, the I.C.I., Ltd., associate. Ordinary shareholders will be offered 4 million additional ordinary shares at 25s. each in 1950 and a further 2 million shares on the same terms in 1951. Devaluation, it was stated, had affected the whole of the mining outlook. Immediate extensions were necessary at the explosives factories, including the new ammonia plant under construction at Modderfontein.

Paper Sacks for Chemicals

A NEW factory for the production of Multiwall sacks is claimed by Bowaters Paper Mills, Ltd., to be only a part of that company's development plans at Ellesmere Port. Multiwall sacks are made from specially prepared paper and are a modern and hygienic form of packaging for bulk commodities; food, fertilisers and a variety of chemicals and other products intended for export.

The new factory is expected to alleviate the effects of the present shortage of hessian sacks. The announcement by the President of the Board of Trade, concerning extension of Bowaters' activities in the Wirral, is taken as foreshadowing an early start of construction of the factory.

New Public Hall

Scottish Oils, Ltd., is co-operating in arrangements for the provision of new public hall facilities at Polbeth, West Calder, in the shale mining area in Scotland.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Polymerisation of esters and methacrylic acid.—E. I. Du Pont de Nemours & Co. May 29 1947. 635,581.

Methods of preparing a monoethyldibenzofuran.—British Thomson-Houston Co., Ltd. June 11 1947. 635,631.

Methods of preparing vinyldibenzofuran.—British Thomson-Houston Co., Ltd. June 11 1947. 635,632.

Manufacture of pyrimidine derivatives.—I.C.I., Ltd., W. R. Boon, and W. G. M. Jones. June 11 1948. 635,582.

Manufacture of substituted mononitronaphthalenes and substituted monoaminonaphthalenes.—Ciba, Ltd. July 17 1947. 635,635.

Manufacture of alkoxy silanes.—Metropolitan-Vickers Electrical Co., Ltd., and W. Simpson. March 2 1948. 635,726.

Separation of components of an azeotropic mixture.—Koppers Co., Inc. July 29 1947. 635,729.

Process and apparatus for the clarification of liquids.—Mirrlees Watson Co., Ltd. Aug. 7 1947. 635,591.

Manufacture of organo silicon esters.—J. G. Dow. (Dow Corning Corporation). Aug. 9 1948. 635,733.

Solid compositions containing diazotisable amines.—I.C.I., Ltd., F. Dawson, J. Swaine, W. Todd, H. Wakefield, and E. R. Wiltshire. Sept. 3 1948. 635,600.

Isomerisation of hydrocarbons.—I.CI., Ltd., D. McNeil, and P. W. Reynolds. Oct. 20 1948. 635,508.

Apparatus for the production of artificial pneumothorax.—T. K. Evangelides. Nov. 26, 1947. 635,749.

Production of organohalosilanes.—Dow Corning Corporation, A. J. Barry, L. De Pree, and D. E. Hook. Dec. 4 1947. 635,645.

Esters of 3, 5, 5-trimethyl-1-hexanol and lubricating compositions.—E. I. Du Pont de Nemours & Co. Jan. 13 1948. 635,656.

Manufacture of water gas.—Humphreys & Glasgow, Ltd., and H. T. Cohen. March 25 1949. 635,414.

Apparatus for cleaning gas.—Humphreys & Glasgow, Ltd., N. H. Williams, and W. Hartley. April 5 1949. 635,589.

Catalytic conversion of hydrocarbons.—M. W. Kellogg. Oct. 6 1942. 636,524.

Pesticidal compositions.—B. F. Goodrich Co. July 18 1946. 636,459.

Wetting and detergent compositions.—American Cyanamid Co. Sept. 26 1946. 636,462.

Synthetic resin latices and method of making same.—B. F. Goodrich Co. Oct. 11 1946. 636,535.

Recovery of chlorohydrins.—Petrocarbon, Ltd., E. F. Chandley, H. M. E. Steiner, and E. Zimkin. Sept. 22 1947. 636,466.

Tolvenesulphonates and their method of preparation.—General Aniline & Film Corporation. Dec. 23 1946. 636,737.

Polymethine dyes.—General Aniline & Film Corporation. Dec. 23 1946. 636,738.

Method of preparing cyanamide and polymers thereof.—Soc. Anon. Des Manufactures Des Glaces et Produits Chimiques De St.-Gobain, Chauny & Cirey. Feb. 11 1947. 636,600.

Production of pitch mastic.—Low Temperature Carbonisation, Ltd., and C. Buist. March 19 1948. 636,602.

Production of double salts and hydrocarbon compositions containing them.—J. C. Arnold. (Standard Oil Development Co.). April 3 1947. 636,552.

Preparation of acylated amines.—Merck & Co., Inc. April 5 1947. 636,603.

Dehydrogenation of secondary alcohols to ketones.—I.C.I., Ltd., D. McNeil, and F. R. Charlton. April 7 1948. 636,743.

Apparatus for separating and forming suspensions of solids in liquids.—Compagnie De Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue. April 21 1947. 636,744.

Production of alkylhalosilanes.—Dow Corning Corporation. June 3 1947. 636,559.

Process for reactivating a spent refining adsorbent.—N.V. De Bataafsche Petroleum Maatschappij. June 16 1947. 636,752.

Preparation of iron oxide reagent.—Gas Light & Coke Co., and R. H. Griffith. June 1 1948. 636,560.

Process for the manufacture of oxygenated compounds by controlled oxidation.—N.V. De Bataafsche Petroleum Maatschappij. June 30 1947. 636,754.

Vapourising and disseminating pest combating compounds.—I.C.I., Ltd., J. Gillies, and W. T. Cunningham. July 18 1947. 636.692.

Method of producing a composite synthetic resin and product thereof.—Koppers Co., Inc. Aug. 6 1947. 636,496.

Reaction products of styrene and anacardic materials.—Harvel Corporation. Aug. 7 1947. 636,694.

Reaction products of styrene aldehydes and polymeric anacardic materials. —Harvel Corporation. Aug. 7 1947. 636,695.

Manufacture of raw material for lacquers from resinous ethylene oxide derivatives of phenols and lacquers made therewith.—Ciba, Ltd. Aug. 7 1947. 636,696.

Manufacture of cyanamide and its derivatives.—Soc. Anon. Des Manufactures Des Glaces Et Produits Chimiques De St.-Gobain, Chauny & Cirey. Aug. 7, 1947. 636,697.

Process for obtaining pure orthotoluene sulphonamide.—Union Chimique Belge Soc. Anon. Oct. 27 1947. 636,504.

Process for the manufacture of an aldehyde from β-ionone.—Roche Products, Ltd. Nov. 13 1947. 636,642.

Production of amidines.—May & Baker, Ltd., and A. P. T. Easson. Nov. 18 1948. 636,777.

Process for the saponification of organic sulphochlorides and purification of the saponification products.—Severoceske Tukove Zavody (Drive Jiri Schicht), Narodni Podnik. Nov. 20 1946. 636,650.

Production of o-alkoxyphenyl glycerol ethers.—British Drug Houses, Ltd., W. Bradley, B. N. Feitelson, and R. M. Lodge. Jan. 6 1949. 636,569.

Reaction products of styrene drying oils and anacardic materials.—Harvel Corporation. Feb. 20 1948. 636,710.

Insecticides.—United States Rubber Co. Feb. 27 1948. 636,582.

Dehydrogenation of secondary alcohols to ketones.—I.C.I., Ltd., D. McNeil, and F. R. Charlton. April 7 1948. 636,300.

Adhesive dispersions of the oil-in-water type, and processes of preparing the same. —Minnesota Mining & Manufacturing Co. Jan. 29 1945. 636,102.

Art of polymerisation and method of polymerising vinylidene-group-containing liquid monomeric compounds.—G. L. Martin Co. March 27 1946. 636,385.

Injection moulding thermoplastic synthetic resins.—Soc. Per Azioni Lavorazione Materie Plastiche. May 2 1946. 636,110.

Colourless polymers of α-haloacrylic acid derivatives.—General Aniline & Film Corporation. May 23 1946. 636,318.

Polymerisation of alpha-halogen substituted acrylic compounds.—General Aniline & Film Corporation. May 23 1946. 636,319.

Method of forming resinous products derived from haloacrylic acid compounds.—General Aniline & Film Corporation. June 28 1945. 636,320.

Polymerisation of haloacrylic acid compounds.—General Aniline & Film Corporation. May 23 1946. 636,321.

Polymerisation of alpha-substituted haloacrylic compounds.—General Aniline & Film Corporation. May 23 1946. 636,322.

Polymerisation of alpha-haloacrylic compounds.—General Aniline & Film Corporation. July 1, 1946. 636,323.

Manufacture of catalysts from clay.—Houdry Process Corporation. Jan. 13 1947. 636,194.

Hydrocarbon conversion processes employing modified clay catalysts.—Houdry Process Corporation. Jan. 14 1947. 636,195.

Method of producing polyamides.—Bata Narodni Podnik. Jan. 17 1947. 636,198.

Method of preparing methyl para-vinylbenzoate and para-vinylbenzoate acid.—Monsanto Chemical Co. Jan. 23 1947. 636,196.

Manufacture of reducing agents derived from alkali sulphides and dyestuff preparations containing them.—Ciba, Ltd. Jan. 31 1947. 636,399.

Method of producing 4-amino-salicyclic acid.—A/B Ferrosan. Feb. 17 1947. 636,331.

Plasticisers for polyvinyl chloride.—Compagnie Française de Raffinage. Feb. 18 1947. 636,400.

Distillation processes and apparatus.—D. G. Randall. Feb. 18 1948. 636,332.

Manufacture of aromatic amino carboxylic acids.—Herts Pharmaceuticals, Ltd., D. D. Martin, D. E. Seymour, and F. S. Spring. Feb. 13 1948. 636,333.

Process for contacting finely divided solids with gases.—J. C. Arnold. (Standard Oil Development Co.). Feb. 28 1947. 636,401.

Process for the production of carbon monoxide and hydrogen.—C. Arnold. (Standard Oil Development Co.). March 31 1947. 636,206.

Production of interpolymers.—B. F. Goodrich Co. April 1 1947. 636,207.

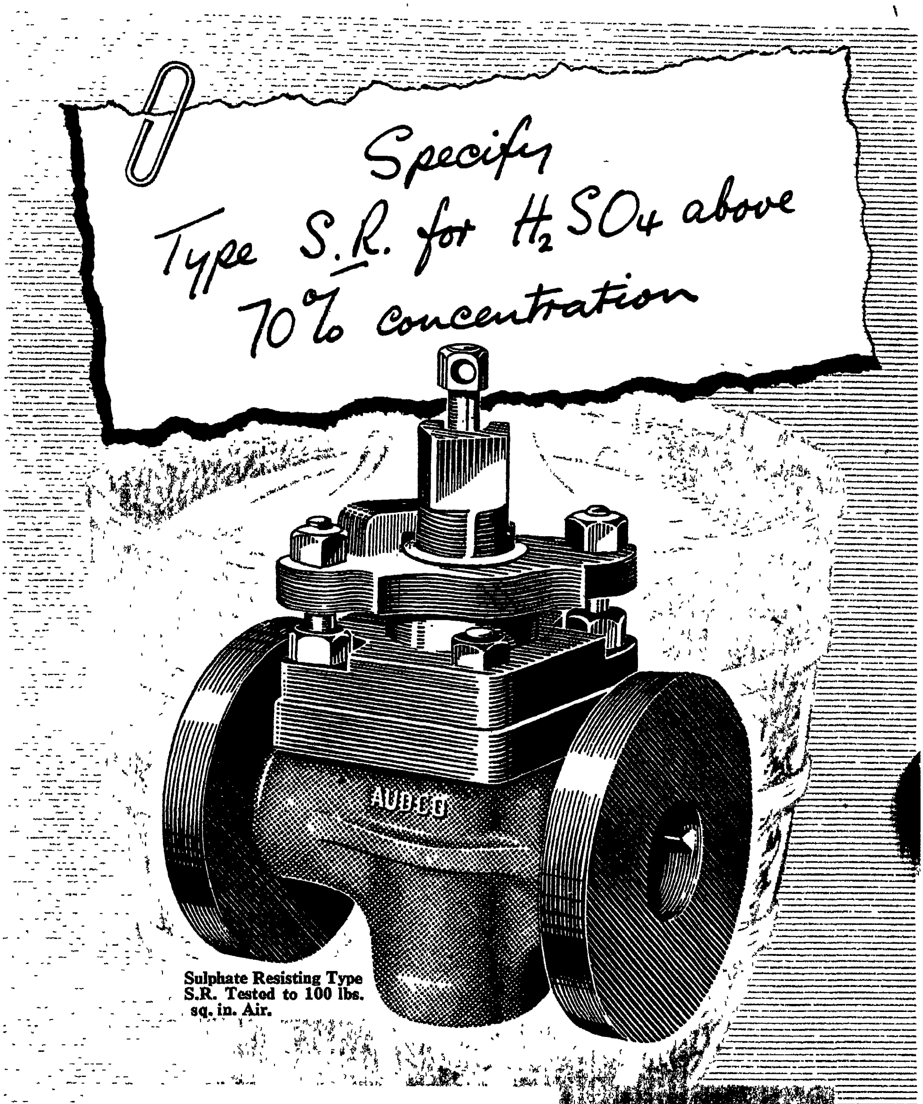
Processes of making agglomerated sodium acid pyrophosphate and the product resulting therefrom.—Monsanto Chemical Co. April 2 1947. 636,209.

Manufacture of aromatic amino carboxylic acids.—Herts Pharmaceuticals, Ltd., D. D. Martin, D. E. Seymour, and F. S. Spring. Feb. 13 1948. 636,347.

Production of synthetic polymers.—S. J. Allen, and J. G. N. Drewitt. Aug. 25 1947. 636,348.

Process for the conversion of solid carbonaceous materials into gaseous fuels.—Standard Oil Development Co., and C. Arnold. June 20 1947. 636,225.

Polymerisation of vinyl halides.—B. F. Goodrich Co. Aug. 7 1947. 636,232.



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Hydrocarbon Studies: The Vapour Phase

A NEW correlation in representing vapour-liquid equilibrium data of petroleum type hydrocarbons has been presented by Elliot I. Organick, of the University of Michigan, at a Houston, Texas, regional meeting of the American Institute of Chemical Engineers. The work was performed under the guidance of Dr. George Granger Brown, co-author of the paper and chairman of the department of chemical and metallurgical engineering at the University of Michigan.

Vapour-liquid equilibrium data are used in determining how much vapour will form when hydrocarbon mixtures are subjected to a specified temperature and pressure. This information is important in designing industrial plant equipment, such as heaters, coolers, condensers, compressors, and distillation columns.

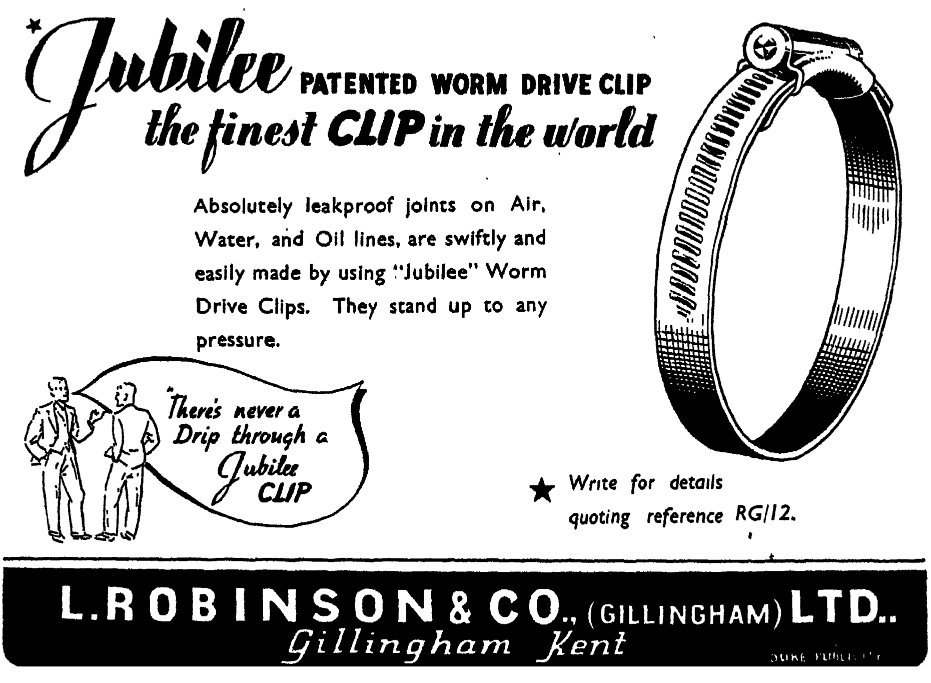
Brown and Organick have revised the calculation methods used to predict hydrocarbon vapourisation properties, so that the laws now apply to systems containing methane, the prime constituent of natural gas. It was previously hard to evaluate such mixtures because of the erratic behaviour of methane when mixed with other hydrocarbons.

Another course of study in an associated field, the improvement of extractive distillation, was also recently described to the AICE in New York. It related to a new simplified method of separation of hydrocarbons of very close boiling points elaborated by H. V. Hess, E. P. Naragon, and C. A. Coghlan, of the Texas Company's laboratories at Beacon, New York.

Extractive distillation, which requires the addition of a third substance to facilitate the separation of two materials which boil at the same temperature, has been used to prepare raw materials for synthetic rubber. In the latest study, various additives to promote the separation of butane and butene-2 which might prove superior to those now in actual commercial use were investigated.

The latter substance is a principal starting material for butadiene, which in turn is the main constituent of GRS type synthetic rubber.

Hess reported on the effectiveness of aniline, from coal tar, and the cereal by-product furfural, as additives or solvents in extractive distillation. Results predicted from laboratory investigations will be used in large-scale pilot plant tests.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Monopoly Hunting

TO all liberal-minded persons monopolies and restrictive practices are detestable. The terms alone invoke visions of the grosser forms of undeserved privilege of whose existence there was no doubt at all in the comparatively recent past. There may exist even to-day some vestigial reminders of Royal prerogative, by which exclusive rights to deal in some more or less essential commodity might be granted to an individual for cash or services rendered. If there are, their effects would not be of the sort which inspires a public demand for reform and it is certainly not to sweep away any such picturesque anachronisms that the Monopolies and Restrictive Practices Act (Inquiry and Control) was given effect in the House of Commons in July 1948.

The operation of this Act is the subject of a report, the first of an annual series, just issued by the Board of Trade, which in this regard holds the ultimate responsibility for sifting the evidence that there exists a case meriting investigation. The Board of Trade is expected to indicate where the quarry lies, but the task of running down the monopoly and possibly arranging for its dismemberment rests with the Monopolies and Restrictive Practices Commission, a council of eight, including, as chairman, Sir Archibald Carter, K.C.B., K.C.I.E. The chairman receives a salary of £5000 a year and this, and the £7500 disbursed in varying proportions to the others, is certainly not money easily earned. Monopolies and restrictions of full production or distribution do not advertise their existence, and when the Board of Trade claims to have discerned one or the other, the M and RP Commission's task of determining whether this is a case in which in the public interest Parliament should intervene would seem to call for most of the qualities of a High Court judge and an economist, and rather more realism than either judges or economists habitually exhibit.

In view of the complications of this modern form of witch hunt, it would be ungenerous to complain that the commission has not yet laid bare one case of disreputable combination or monopolistic plot, the existence of which was not doubted by those who piloted the Bill through the House. It has, however, certainly not been idle, for the Board of Trade has put up six subjects for its investigation, and chose them to cover a wide range of different types of activity, "so that the commission's first reports should enable a considerable section

On Other Pages

Leader:

Hunting Monopolies . . 423

Notes and Comments:

Few Chemicals for India . . 425
Wartime Sacrifices . . 425
Atomic By-Products . . 425
Wide Horizons . . 426
Heraldry . . 426
U.S. Buys Fewer Chemicals . . 426
India's Soda Ash . . 427
Antibiotic Research . . 427
Penicillin to be Made in India . . 427
Scottish-U.S. Liaison . . 428
Borax Chemicals Recovery . . 428
Royal Society Fellowships . . 428
Spain to Produce More Nitrate . . 428
February Chemical Exports . . 429
Inflammable Coatings . . 430
New British Standards . . 430
High-Vacuum Equipment for Canada 430
Hot Spraying Cellulose Lacquers . . 431
U.S. Atomic Research . . 433
German Under-Water Paints . . 435
Toxic Factor in Agenised Flour . . 436
"Glassware Monopoly" . . 442
Parliamentary Topics . . 442
Obituary: Sir Norman Haworth . . 444
Prices of British Chemical Products 449
Next Week's Events . . 454

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of industry to work at its trading practices in the light of authoritative judgments." The six chosen are all concerned with supply (as opposed to production) and relate to these goods: Dental goods, electric lamps, electric wires and cables, watch-making machinery, matches and exports of matches, and builders' castings made of cast iron (gutters, water pipes, etc.).

Comment on any of these cases would be out of order, but from the terms of the Act it follows that the Board of Trade suspects that the supply or export arrangements of one-third of the total production of each of these classes of goods are the subjects of restrictive practices. In the instance of electric lamps that belief is shared by the Co-operative Union, whose Parliamentary Committee has been active in this and some other cases of supposed restrictive practices. Independent requests that the Board of Trade should investigate the possibility that normally competitive conditions are being repressed in any industry are, of course, an essential feature of this legislation, so that the Board is unlikely to have much difficulty in finding further material for inquiry. Most of these recommendations to the Board have related to impediments which associations of distributors or manufacturers, generally the former, are alleged to have placed in the way of non-members seeking to participate. Withholding supplies or offering unfavourable discounts to dealers have been alleged. In that category fall nine classes of trade, among them chemists' goods, galvanised hollow-ware, laboratory equipment, plate glass, cement and tea seed oil. All have been "cited."

One of the unanticipated results of the first year's operation of the Act is the relatively small attention paid to "chemicals," which Left-wing propaganda has often sought to represent as the natural sphere of monopolies. "Chemicals," Calor gas and medical and industrial gases have in fact been mentioned as deserving investigation. The Board, which since the autumn of last year has had before it the Association of British Chemical Manufacturers' comprehensive review of some principal chemical industries, has not given "chemicals" the priority some would like. The Board might conceivably have taken the view that some of the "giants" of the industrial landscape are as important for a sound economy as were the windmills against which Don Quixote broke his lance.

Notes and Comments

Few Chemicals for India

THE performance of chemical export trading groups last month appears to reflect a rising level of activity, which is not immediately apparent to the cursory view, seeing the February total of chemical export sales only in its relation to the January figure. The total of £6,851,945 in the 24 working days afforded by February provided over £100,000 more than was secured in February a year ago. The quality of that achievement can be fully appreciated when it is noted how heavy have been one or two recessions in traditional sources of revenue, of which the Indian market is the outstanding example. Within 12 months India's monthly purchases of U.K. chemicals—" chemicals, drugs, dyes and colours "—have contracted by over £800,000, to £277,247. There were, for example, in February no sales of sodium carbonate or caustic soda (which together realised over £137,000 a year before), and Indian purchases of nearly every other class of chemical material were correspondingly cut. Indian home production, meanwhile, is still conspicuously ill equipped to fill the gaps.

Wartime Sacrifices

THE effect of war upon chemical industries is a recurrent theme, which day-to-day events make hard to ignore. It was, not inappropriately, one of the matters to which Sir Frederick Bain invited the attention of the Canadian members of the SCI and the Chemical Institute of Canada when he spoke as a guest of honour in Montreal last month. The deputy chairman of I.C.I., Ltd., made very clear to the Canadian chemists what is no doubt occasionally forgotten when comparisons are made outside this country of the phenomenal rate of advance in technology and industry in North America and what has been done here. He recalled to them that not only were U.K. chemical industries and their research departments in battle dress for six years, but they deliberately relinquished to the American countries many projects which have yielded to others results of world-wide importance. Among the many historic examples of that policy is one which is frequently overlooked, the genesis of large-scale production of synthetic rubber. That, Sir Frederick Bain indicated, might now be a flourishing industry in Great Britain had it not been deemed better strategy, when Malaya fell, to leave to the U.S.A. and Canada the whole responsibility for the development and production of speciality and general purpose rubbers. The rightness of the decision at that time, observed Sir Frederick Bain, did not alter the fact that it had left a gap in our industry which must remain unfilled " for some time." He did not disguise his conviction, however, that all such voids in the programme of British chemical industries were not going to be permanent. Recalling that he had more than 40 years' experience in those industries, he told his Canadian audience: " I have seen good times and bad times. I have seen a complete revolution in the methods and the processes of the industry. Never have I seen it so alive to the new knowledge that is pouring in from the laboratories of the world. I have never known all ranks of our industry to work so hard."

Atomic By-Products

THE impression which becomes increasingly hard to repel, although it is probably false, that most practical benefits of atomic energy research are likely to be reserved for the next generation does not gain much support from the current report of the U.S. Atomic Energy Commission. This is the seventh semi-annual survey of the vast American programme, to which $81 million is being devoted this year, to pursue all the far-ranging investigations associated with nuclear fission. It shows how intimately these studies now affect practical and fundamental concepts of chemistry and metallurgy. It invites the conclusion that, however nebulous may be some of the anticipated results of nuclear fission as a power source, the incidental discoveries can hardly fail to open up new vistas in more practical techniques, related to such subjects as chemical separation and analysis, thermodynamics and corrosion. Metallurgy, in particular, is capable of receiving new knowledge from the current examination in the U.S.A. of metal atomic structures, the influence of radiation on mechanical and electrical properties, and possibly great practical advances when the present endeavour to establish the basic nature of corrosion is complete. The last has a separate backing from the U.S. Navy's research departments, while the AEC has narrowed its studies to one or two metals, notably zinc and titanium.

Wide Horizons

CHEMISTS and other scientific people have been invited once more to ponder the need for present-day scientific workers to liberate themselves from the rigid bonds of specialisation. The renewed approach was made by Professor John Read, of the University of St. Andrews, in the Pope Memorial Lecture at the Royal Society of Arts this week. He, like most others on the same subject, cited as an example of emancipation, one whose great spiritual and intellectual endowment distinguished him very markedly from most of his contemporaries, Sir William Jackson Pope, the Cambridge professor of chemistry whose contributions in stereochemistry alone opened up new horizons. Sir John Read, however, offers something more realistic than the conventional conclusion that culture must be added to scientific study rather like a decorative embellishment. His theme, "Chemistry as an Instrument of Culture," made effective use of the possibilities of the widest kind of intellectual activity within the framework of chemistry and its widespread points of contact with most other human activities. The alchemists, on whom he is the recognised authority, were often classic examples of the capacity for relating most human and celestial things to their own line of thought. The circumstance that their own peculiarly specialised study, the quest for the great transmuting agent, went unrewarded, cannot fairly be held against them in view of the great advances of natural philosophy, as well as practical techniques, which they fathered. Those who are sceptical about the prospects of an intellectual renaissance in chemistry and the sciences may find discouragement in the fact, recalled by Professor Read, that Sir William Pope's unique record of alchemy, his precious collections of paintings and engravings, now rests in the Fisher Scientific Company's collection—in Pittsburgh, Pennsylvania.

Heraldry

THE capacity of large commercial interests to foster things which have no evident link with business is fortunately not peculiarly American. Further evidence of this is the new publication on "The Colour of Chivalry," in which fine colour plates by Gerald Cobb, miniaturist to the College of Arms, and text by Harold Periera, are magnificently presented between gold covers. I.C.I., Ltd., were responsible for this. It presents vividly and accurately richly decorative examples of amorial bearings originally reproduced for publication in overseas periodicals to make known I.C.I.'s capacity as a producer of pure colours. The book will not be sold or otherwise made available to the public, but is being presented to history tutors at the universities and to schools and art schools throughout Great Britain.

U.S. BUYS FEWER CHEMICALS

FOR the third consecutive year, U.S. imports of chemicals and allied products have dropped in dollar value. In 1949 they reached the post-war low level of $230,366,000, compared with $276,377,000 in 1948, and the high record figures of $323,259,000 in 1947. Against this, U.S. exports of chemicals in 1949 are recorded as being 370 per cent more than pre-war.

INDIA'S SODA ASH

Import Duty and Subsidy

THE Government of India has accepted the recommendations of the Tariff Board to grant protection to the soda ash industry for a period of three years, to March 31, 1953.

In view of the fall in the landed cost of imported soda ash, which has occurred since the Tariff Board submitted its report, the duty on soda ash will be increased to 40 per cent *ad valorem* if the manufacture is of a British colony, and 50 per cent if the manufacture is of any other country.

The Government has accepted the principle of a subsidy and considers that this should be Rs. 1 per cwt. This will be granted on soda ash produced by the specified Indian companies and sold from the date of this order.

The Minister of Commerce, Mr. K. C. Neogy, said in the Dominion Assembly at New Delhi, that the gaps between supply and demand in 1948-49 were of the order of 60,000 tons of caustic soda and 50,000 to 60,000 tons of soda ash. The indigenous soda ash factories produced only light ash which was said to be unsuitable for the manufacture of glass and silicate. These industries required heavy ash which had to be imported from abroad, unless the glass furnaces and equipment were adapted to the use of light soda ash.

The indigenous production of caustic soda, said Mr. Neogy, was less than 10 per cent of India's total requirements. After taking note of the present stock position and considering the views of the manufacturers concerned, it was decided to allow imports of 25,500 tons of caustic soda during January-June, 1950.

(Board of Trade returns show there have been no exports of sodium carbonate and caustic soda to India this year.)

ANTIBIOTIC RESEARCH

New Laboratories and Pilot Plant

ANTIBIOTIC research laboratories and pilot plant are being set up by Glaxo Laboratories, Ltd., in a large mansion at Sefton Park, near Stoke Poges, Bucks. The new research unit will be wholly concerned in finding and developing new antibiotics and will be in operation later this year.

The property, which occupies 28 acres, was once the home of Lady de Frece, better known as Vesta Tilley, the famous music hall artiste. Previously the estate had been owned by the Decies family and also by the Oppenheimers.

On the ground floor of the mansion (formerly the home of Lady de Frece) three main chemistry laboratories will be constructed and there will be refrigeration and balance rooms and suitable accommodation for ancillary services. The first floor will be occupied by microbiological laboratories, incubation and sterile rooms and executive offices. Adjoining the main building a pilot plant and boiler house are being erected on the site of the original coach houses and outhouses.

The new departments implement the policy mentioned by Sir Harry Jephcott in his recent annual review of the company's affairs: "Only sustained research and its industrial application can ensure that these factories (Barnard Castle and Ulverston) combine to compete successfully in the world's markets with the very large output of the flourishing United States antibiotic industry."

The Barnard Castle (Co. Durham) factory of Glaxo Laboratories, Ltd., which has been engaged in streptomycin production since 1946, has reverted to the manufacture of penicillin. It will henceforth be largely concerned with secondary products of penicillin and their packaging.

Penicillin to be Manufactured in India

AT the recent annual session of the Indian Chemical Society, at Poona, Dr. J. N. Ray, Deputy Director General of Industries and Supply, Government of India, emphasised the need to develop India's technical manpower for her industrial advancement.

He said the Government had decided to start the manufacture of penicillin as a State enterprise with the co-operation of a foreign firm. The initial capacity would be 1200 billion units per year with a provision to increase it to 3600 billion units, if necessary. The manufacture of sulpha drugs and synthetic anti-malarials would also be undertaken in the same factory. The collaboration of a foreign firm had also been obtained for the production of para-amino-salicylic acid, the new curative agent in the treatment of tuberculosis.

Three firms had been granted licences for the production of acetic acid and acetic anhydride. The aggregate production would be 3000 tons per annum, more than India's present requirements. A British firm had surveyed the possibility of the manufacture of industrial explosives in India and the scheme was under the Government's consideration.

SCOTTISH-U.S. LIAISON

U.S. Products for Empire Markets

SOME 400 Scottish firms, mainly in the technical field, engineering and chemical processing, have indicated readiness to co-operate with American or Canadian firms to produce, under licence, North American goods in Scotland. The Scottish Council is organising the scheme, which promises to continue a system which has already conferred benefits in Scotland.

The intention is to offer suitable contacts with North American and Scottish firms to produce goods or products which are not now made here and for which a British Empire market exists.

The Scottish Council is also sponsoring the launching of electronic industry development in Scotland. Some 15 firms are represented on a body which is being formed to discuss large expansion of this industry in Scotland.

Borax Chemicals Recovery

THE further decline in trading profits of Borax Consolidated, Ltd., for 1949 was attributed by the company's chairman, Mr. D. Abel Smith, almost entirely to the course of domestic trade in the U.S.A. and Canada. He was speaking at the annual general meeting of the company in London last week.

A recession had set in during the spring, said Mr. Smith, which many had thought would become a slump. This had influenced the glass and enamel industries, in particular, causing a decline in sales. The recession had, however, the beneficial effect of reducing stocks of finished goods, and soon gave way to a recovery.

A satisfactory note of prosperity had closed the year's trade in the U.S.A.

The company's home and other foreign sales were maintained on about the level of the previous year, and the Government control exercised over the industry in the United Kingdom during the war years and after was largely terminated on April 1, 1949, the chairman said.

Fixed assets abroad—mines, properties, buildings, plant and machinery—figured in the balance sheet in sterling at the rates of exchange in force at the times of acquisition; they remained unaffected by subsequent fluctuations of exchange rates.

I.C.I. Plans Approved

Plans for the further extension of the existing I.C.I. factory were considered by Grangemouth Dean of Guild Court, last week and approved. These form part of I.C.I's five-year expansion programme.

ROYAL SOCIETY FELLOWS

Chemists and Physicists Elected

THE following scientists associated with chemistry or physics were among those elected to fellowship of the Royal Society at its meeting on March 16. The work for which each is particularly distinguished is shown in parentheses after the name:—

BATES, Leslie Fleetwood. Professor of physics, University of Nottingham. (Experimental physics, particularly researches on the properties of ferromagnetic substances.)

BENNET-CLARK, Thomas Archibald. Professor of botany, King's College, London. (Plant physiology, particularly on organic acid metabolism, and the control of water in plant cells.)

BLEANEY, Brebis. Demonstrator and lecturer in physics, Oxford University. (Experimental physics, especially microwave spectroscopy and low-temperature physics.)

COULSON, Charles Alfred. Professor of theoretical physics, King's College, London. (Application of quantum theory to chemical problems.)

ELFORD, William Joseph. Biophysicist, National Institute for Medical Research, London. (Viruses, particularly methods of determining virus size.)

HOWARTH, Leslie. Professor of applied mathematics, University of Bristol. (Mathematical theory of the boundary layer, the theory of isotropic turbulence and gas dynamics.)

JONES, Ewart Ray Herbert. Professor of organic chemistry, University of Manchester. (Organic chemistry, particularly in the fields of steroids, carotenoids and the chemistry of acetylene.)

MARTIN, Archer John Porter. Biochemist, National Institute for Medical Research, London. (Development of liquid-liquid partition chromatographic methods of chemical analysis.)

MORTON, Richard Alan. Professor of biochemistry, University of Liverpool. (Chemistry and biochemistry of the fat-soluble vitamins.)

SHENSTONE, Allen G. Professor of physics, Princeton University, U.S.A., formerly scientific liaison officer in London of the Canadian National Research Council. (Spectroscopic researches.)

STACEY, Maurice. Professor of chemistry, University of Birmingham. (Organic chemistry, especially studies of the carbohydrates of animal tissue and of micro-organisms.)

SUTTON, Leslie Ernest. Demonstrator and lecturer in physical chemistry, Oxford University. (Electrical properties of molecules.)

SYNGE, Richard Lawrence Millington. Biochemist, Rowett Research Institute, Aberdeenshire. (Application of the principle of partition chromatography to the separation of amino-acids and peptides.)

Spain to Produce More Nitrate

THE need to establish an efficient home fertiliser industry in Spain is likely to be met in part by the operation, which began this month, of the nitrate factory, Nitratos de Castilla, Valladoid.

The factory is to produce 32,000 tons this year and has as its target 64,000 tons for 1951, states a report on Spanish industries recently issued by Señor Suanzes, Minister of Industry and Commerce.

Domestic agricultural requirements of nitrate are estimated by the minister at 600,000 tons a year and it is hoped that production will be increased to supply this amount during 1951-53.

FEBRUARY CHEMICAL EXPORTS

£1m. Less Than January's Total

WITH a total of £6,851,945, exports of chemicals, drugs, dyes and colours in February were worth about £1 million less than in January (£7,984,581), yet they showed a comparatively small increase over February 1949 (£6,737,482). Individual items recording the principal decreases in the month (January figures in brackets) were: Cresylic acid £30,392 (£53,714); salicylic acid and salicylates £9,540 (£14,905); ammonium sulphate £244,705 (£542,345); bleaching powder £16,891 (£24,747); lead acetate, litharge, red lead, etc., £22,866 (£47,469); tetra-ethyl lead £228,502 (£266,564); magnesium compounds £25,906 (£37,762); salt £121,984 (£157,225); sodium carbonate £138,773 (£164,870); caustic soda £217,106 (£292,490); tar oil, creosote oil, anthracene oil, etc., £39,493 (£148,788); quinine and its salts £12,678 (£43,738); acetyl-salicylic acid £24,143 (£64,754); insulin £21,286 (£41,744); penicillin £173,637 (£273,273).

EXPORTS

	Feb., 1950	Feb., 1949
	Gal.	Gal.
Cresylic acid	152,396	120,918
	Lb.	Lb.
Salicylic acid and salicylates ...	76,252	147,471
Value of all other sorts of acid ...	£127,111	£96,171
	Tons	Tons
Sulphate of alumina	2,482	2,866
All other sorts of aluminium compounds	530	1,420
Ammonium sulphate	13,522	14,792
Ammonium nitrate	10,333	10,107
All other sorts of ammonium compounds	1,143	1,654
	Cwt.	Cwt.
Bleaching powder	16,033	34,799
All other bleaching materials ...	9,947	10,214
Collodion cotton	1,465	2,283
	Tons	Tons
Copper sulphate	4,531	1,962
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	29,533	37,845
	Tons	Tons
Fertilisers	1,832	2,192
Value of gases (compressed, liquefied or solidified)	£30,186	£30,763
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	3,914	5,914
	Gal.	Gal.
Tetra-ethyl lead	114,920	92,217
	Tons	Tons
Magnesium compounds	557	751
	Cwt.	Cwt.
Nickel salts	6,815	3,195
Potassium compounds	7,746	6,528
	Tons	Tons
Salt	15,831	13,665
	Cwt.	Cwt.
Sodium carbonate	245,304	324,348
Caustic soda	186,078	149,758
Sodium silicate	24,598	18,897
Sodium sulphate	35,162	48,315
All other sodium compounds ...	74,147	80,802
	Gal.	Gal.
Tar oil, creosote oil, anthracene oil, etc.	800,446	440,021
	Tons	Tons
Zinc oxide	1,438	1,176
Total value of chemical manufactures (excluding drugs and dyestuffs)	£3,847,586	£3,400,362
Value of quinine and quinine salts	£12,678	£30,721
	Lb.	Lb.
Acetyl-salicylic acid	132,936	81,488
	100 International units	100 International units
Insulin	552,122	1,198,804
	Mega units	Mega units
Penicillin	755,614	429,887
Total value of drugs, medicines and preparations	£1,338,644	£1,368,308
Total value of dyes and dyestuffs ...	£714,697	£1,002,767
Total value of paints, pigments, colours, etc.	£951,018	£965,995
	Cwt.	Cwt.
Plastic materials	45,458	80,224
Value	£504,675	£388,476
	Cwt.	Cwt.
Chemical glassware	985	1,149
Value	£38,156	£43,167
	Cwt.	Cwt.
Fans	7,732	5,027
Value	£169,551	£132,763
	Cwt.	Cwt.
Furnace plant	8,054	5,401
Value	£80,257	£59,279
	Cwt.	Cwt.
Gas and chemical machinery ...	23,500	21,050
Value	£313,077	£250,931

IMPORTS

	Feb., 1950	Feb., 1949
	Cwt.	Cwt.
Acetic anhydride	4,623	12,482
Acetic acid	—	—
Boric acid	11,900	4,868
Carbolic acid	—	10,199
Value of all other sorts of acid ...	£57,205	£60,557
Borax	23,000	26,700
Calcium carbide	38	7,377
Cobalt oxides	536	991
	Tons	Tons
Fertilisers	21,202	14,090
	Lb.	Lb.
Glycol ethers and glycol ether esters	352,749	328,998
Iodine	132,100	—
	Cwt.	Cwt.
Potassium chloride	342,912	459,259
Potassium sulphate ...	29,020	54,360
All other potassium compounds	11,249	9,512
Sodium nitrate	10,000	—
All other sodium compounds	10,724	4,582
Carbon blacks (from natural gas)	89,091	83,497
Value of carbon blacks	£378,891	£258,936
Total value of chemicals, drugs, dyes and colours	£2,634,346	£2,217,631
	Tons	Tons
Sulphur	25,975	29,695
Value	£248,187	£248,508
	Cwt.	Cwt.
Gas and chemical machinery ...	1,464	131
Value	£66,305	£10,713

INFLAMMABLE COATINGS

Railway's Views on Cellulose Lacquer

THE rapid spread of a fire on the Edinburgh-King's Cross express in June last year was stated to have been due to the clear cellulose lacquer with which the walls of the corridor had been sprayed.

Colonel R. J. Walker, inspecting officer of railways, who conducted the Ministry of Transport inquiry, found that the asphyxiating fumes in the coaches were nitrous gases, such as were to be expected when cellulose burns.

The coaches had been built for the LNER in 1947, and the railway company had specified the components, the oil-bound paints to be used.

The inspecting officer concluded that permission must have been given to use also clear cellulose and insufficient attention had been given to the inflammable possibilities of the additional material.

Immediate action had been taken to withdraw from service any other coaches known to have been sprayed with such material.

A Disclaimer

A representative of British Cellulose Lacquers, Ltd., has since expressed the view to THE CHEMICAL AGE, that cellulose lacquer of correct specification is not readily inflammable. It is being increasingly used as a finish on household and other goods. If, as stated in the report, the clear cellulose lacquer was largely responsible for the rapid spread of the fire, it must, he suggested, have been due to the faulty quality of the lacquer employed.

NEW BRITISH STANDARDS

Tubes for Petroleum Industry

TWO further documents in the series of British Standards which are being published for the petroleum industry have just been issued by the British Standards Institution.

These standards are for cold drawn seamless low carbon steel tubes (B.S. 1627) and cold drawn seamless alloy steel tubes (B.S.1628), both for heat exchangers and condensers for the petroleum industry.

Provision is made for one grade of low carbon steel tubes and two grades of alloy steel tubes in sizes from ½ in. up to any gauge less than 2 in. outside diameter. Details are given of the chemical composition and mechanical properties required, as well as methods of test and tolerances.

In view of the international character of the petroleum industry special consideration was given to standard A.179 and A.199 of the American Society for Testing Materials and to the advantage of securing interchangeability between American and British equipment.

Dimensions for spigot and socket and conical flanged stoneware pipes and pipe fittings for chemical purposes are the subject of another new British Standard (B.S. 1684).

The standard provides tables for standard dimensions for the following types of fittings: single and double 90° junctions; single and double 45° bends; equal and unequal tees and crosses. It also describes accuracy tests of conical flange fittings.

High Vacuum Equipment to be Shown in Canada

PROMISING to be an important part of the range of British scientific instruments to be exhibited in May at the Canadian International Trade Fair is the comprehensive selection of high vacuum equipment manufactured by W. Edwards & Co. (London), Ltd.

A pre-view of some of the most important exhibits was given this week to the technical Press and others at the company's modern works on the outskirts of London; this amply illustrated the rapid progress of high vacuum technology for industrial application during the past 10 years or so. A representative of THE CHEMICAL AGE was told that there is virtually no known aspect of that subject which the company is not studying. Work is also undertaken to design and manufacture plant to any individual requirements.

A full range of gauges has been developed for the measurement of high vacuum. For the measurement of the highest vacua in the laboratory a thermionic ionisation gauge has been developed, similar in principle to a triode vacuum tube. The gauge is highly sensitive, continuously indicating, and measures pressures from .02 to 10^{-8}.

A much simpler type is a small dial gauge which records from atmospheric down to 1 mm. pressures.

Interesting innovations in the company's vacuum coating technique include the model 6E coating unit for experimental work and the 12E evaporating unit for small scale production.

HOT SPRAYING CELLULOSE LACQUERS

Balancing Viscosity and Film-Forming Properties

by A. E. LAIN, A.R.I.C., M.P.S. *

THE chief film-forming component of lacquers formulated for hot spraying is a cellulose derivative, usually the nitrate. Modifying agents such as natural and synthetic resins and plasticisers of the solvent and non-solvent types are used to enhance such properties as film thickness, adhesion, toughness, gloss, and so on. The liquid portion of the lacquer usually consists of a mixture of solvents such as the acetic acid esters of the lower aliphatic alcohols or the lower homologues of the aliphatic and aromatic ketones.

Aliphatic and aromatic hydrocarbons and the lower alcohols, known as diluents, are also used, and form a not inconsiderable part of the volatile portion of a cellulose lacquer. They serve to reduce the cost and increase the solvent power of the mixture.

The cellulose lacquer film was formed after application by the evaporation of the various solvents and diluents, whereas synthetic stoving varnish and traditional-type oil varnish films harden by condensation and oxidation. As no chemical change takes place in the formation of a cellulose film, most of the film-forming components are materials of relatively high molecular weight and produce solutions of high viscosity in organic solvents.

Comparison with Resins

Clear cellulose lacquers of good quality for application under normal conditions therefore contain about 20-30 per cent of film-forming components, compared with 45-50 per cent or even more which is possible with the more recent synthetic finishes derived from urea-formaldehyde, alkyd resins or mixtures.

During the last 25 years considerable progress has been made in the manufacture of cellulose nitrates which yield solutions of lower viscosity. While resins generally produce lower-viscosity solutions than cellulose nitrate, the ratio of resin to cellulose nitrate which can be used without affecting the durability of the film is strictly limited.

Higher ratios of synthetic resins, for example, non-drying oil-modified alkyds or rosin-modified maleics, may be used when they replace resins such as dammer and ester gum, but very little increase in total solids results because synthetic resins of that type produce solutions of higher viscosity.

As cellulose lacquers are normally applied by a spray gun, the viscosity is important, for it sets a limitation to the percentage of film-forming components which it is practicable to spray. The efforts of manufacturers of cellulose lacquers are therefore constantly directed to increasing the total film-forming ingredients without sacrificing other desirable characteristics of cellulose solutions, such as hardness, durability, and so on.

Solvents and Solids

The lower molecular weight solvents, such as ethyl acetate, acetone and methyl ethyl ketone produce solutions of low viscosity with nitro-cellulose and resins, and it has been suggested that the solid content of lacquers of sprayable viscosity could be increased if the proportion of such solvents was raised. As those solvents evaporate so quickly, however, there is a considerable increase of viscosity as the lacquer passes from the spray gun to the article to be sprayed, and the solution should be sprayed at a lower initial viscosity. In consequence, some of the advantage in using such solvents is lost.

If a lacquer contains no low-boiling solvents, it is possible to spray it satisfactorily at a viscosity of 130 centipoises; on the other hand, if 12½ per cent of the liquid portion of that mixture contains solvents of that type, it is necessary to decrease the viscosity to 80 centipoises. If an adjustment of that nature is not made, the material, on striking the surface, would be insufficiently fluid to flow, and the "orange peel" effect would result. As it is necessary to add about 12 per cent solvents mixture to reduce the viscosity from 130 to 80 centipoises, the advantages of using low-boiling solvents are problematical.

Correct spraying viscosity is an important factor in the satisfactory application of cellulose lacquers. If a lacquer is heated in a closed container the reduction in viscosity is considerable. For example, a lacquer having a viscosity of 355 centipoises at 24°C. is reduced in viscosity to 80 centipoises at 60°C., a viscosity at which it was capable of being atomised with the spraying equipment normally available. Another lacquer having a viscosity of 270 centipoises at 23°C., has a viscosity of 60 centipoises at 60°C.

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* Summary of a paper presented before the London Section of the Oil and Colour Chemists' Association on March 15.

As it would normally require 30 per cent of thinners to reduce that lacquer to spraying viscosity, the application of the undiluted material results in approximately 33 per cent more film-forming materials being applied. One writer has claimed that a lacquer having the same viscosity at 71°C. as another at 27°C. would have 40-50 per cent greater solids content.

Thicker Hot Films

Hot spraying thins a high solids lacquer to spraying consistency. The application of cellulose lacquer at elevated temperatures undoubtedly results in the deposition of a thicker film or, alternatively, reduces the number of coats necessary to give the required film thickness.

The temperature at which hot lacquers are applied varies within considerable limits, but a temperature range of 66°-80°C. is usually employed. The manufacturer standardises the viscosity of the cold material so that when raised to a chosen temperature its viscosity is reduced to 80-100 centipoises.

The question of degradation of the cellulose component of the lacquer as a result of heating does not arise, since in modern plant the lacquer is not heated until it enters the coil and then is sprayed almost immediately. The reduction in viscosity due to heating ensures that the material is broken up into small globules in the spray cone.

A thermometer placed in the fan spray at various distances from the nozzle has shown that the temperature of the lacquers in the circuit was 76°C.; ½-in. from the nozzle it was 46°C.; 3-in. from the nozzle, 38.5°C.; 6-in. from the nozzle 31°C. The shop temperature was 26.5°C. The temperature of the air stream alone was found to be 21°C. on expansion; that of ordinary unheated lacquer was as low as 15°C. at 6-in. from the spray gun.

It is therefore evident that a heated lacquer, which would normally have a viscosity of 80-100 centipoises at 80°C., would have a viscosity, through cooling and loss of solvents, of considerably over 300 centipoises within a few seconds of striking the surface to be sprayed.

There is no evidence to suggest that the film-forming components of a hot lacquer should differ from a lacquer intended for use under normal conditions, except that they will be present in a higher proportion. The attention of manufacturers is therefore centred chiefly on the composition of the volatile portion of the material.

It has frequently been pointed out in the technical Press that the dilution ratio of solvents for nitro cellulose decreases with rising temperatures, and on that account the proportion of active cellulose solvents should be greater in cellulose lacquers for application at elevated temperatures.

There are, however, more considerations necessitating an increase in the active solvent content. (A solvent mixture rich in active solvents will in itself increase the proportion of non-volatile components of the lacquer for a given viscosity).

If the film is to present a smooth, bright appearance the particles must still retain a measure of fluidity. It is therefore usual, in formulating hot lacquer, to reduce or eliminate all low-boiling solvents and diluents such as ethyl acetate, acetone, toluol and methyl ethyl ketone, and increase the quantities of such solvents as butyl acetate and butyl alcohol.

One writer goes so far as to suggest that there were no upper limits to the amount of amyl acetate that could be used with advantage in a hot lacquer and considers that it might even serve as the sole volatile constituent. The minimum quantity is estimated to be 50 per cent. A solvent mixture rich in high-boiling active solvents for cellulose nitrate would also have a favourable influence on the amount of film-forming materials.

Time and Costs

The rate of drying and hardening is considerably affected by the thickness of the film deposited, and it is not surprising that hot lacquers should take longer to dry and harden than do those applied under normal conditions. For that reason the use of the extra high-boiling solvents such as cellosolve, ethyl lactate, methyl cyclohexanone, is undesirable if prolonged drying periods are to be avoided.

The film-forming constituents of cellulose lacquer are normally more costly than the volatile portion and the proportion of the more expensive active high-boiling solvents is usually higher. Hot lacquers are more costly, by 20-23 per cent, than those for use under normal conditions.

Another factor is that atomised particles of a hot lacquer increase rapidly in viscosity, so that they do not wet the work so readily as a lacquer applied under normal conditions. The operative is likely automatically to apply more material per unit of area. The additional cost may be considerable.

U.S. ATOMIC RESEARCH

Increasing Influence on Chemical Procedures

THE scale now reached by national atomic energy research projects in the U.S.A. is reflected in the totals of scientific manpower and money employed in the work described in the current semi-annual report of the U.S. Atomic Energy Commission. This is the seventh in the series of reviews presented to Congress and shows that the main departments of research alone will spend about $81 million this year and monopolise the services of 5400 scientists.

This does not, of course, represent the entire American effort. There are large auxiliary undertakings concerned with classified research, Services' uses and commercial applications. Of the total effort by all these interests no true estimate can be formed.

The main State allocation of dollars is being divided in almost equal proportions between two sections, research in physical sciences ($31 million) and development of reactors ($33 million) and $17 million will be used for biological and medical science. Very much more will in fact be spent by official agencies this year in the U.S.A., taking into account the large expenditures additional to current research, including such items as £41 million for construction required for reactors and $25 million for new physical research facilities.

The AEC report is amply reveiwed by *Chemical and Engineering News* (**20**, 537-539). This points to the fact that a sizeable portion of the problems of atomic energy development are chemical in nature. In most studies of atomic nuclei, chemistry plays some part and in others it plays a major rôle. This is particularly true in the handling and processing of special materials that result from nuclear reactions, or are essential to bring them about.

Exploring the Unknown

Most chemical research conducted by the AEC is directed toward solving practical problems. In many cases this involves development or adaptation of already understood principles of the behaviour of atoms and molecules. In other instances, however, the principles are so new that the work of the chemists is essentially basic in that it involves explorations in unknown regions.

In the U.S.A. the AEC has sanctioned the use of some uranium metal in commercial laboratories. This 4-in. rod of uranium is used by Dr. W. Davidson in the B. F. Goodrich research centre

Much of the chemist's work in the field of atomic energy comes under the deceptively simple heading "chemical separation." The separation or extraction of one material from another, or more often from a mixture of others, had to be resolved in order to make the bomb possible. Similarly, future progress is dependent on more effective means of carrying out complex separations.

With the exception of two series of elements, the chemical properties of elements are dependent to a great extent on the number of electrons in the outer shell. In such cases there is a fairly sharp change in chemical properties between elements.

In the rare earth series (cerium, No. 58, lutecium, No. 71) and in the radioactive series comprising actinium (89), thorium (90), protactinium (91), uranium (92), neptunium (93), plutonium (94), americium (95), curium (96), and berkelium (97), such sharp changes are not evident.

In these two areas successive elements are built up, not by additions to the outer shell, but by various additions and adjustments to the inner shells. It is in these two families of elements that separations in a pure form are difficult.

The prime objective of the chemical research programme is to gain a greater understanding of the chemical characteristics of the heavy element transition series. Knowledge gained about some of these elements has assisted in dealing with the chemistry of others in the same series. Since available samples are often of the order of a few millionths of a gram, their chemical properties are most often studied by tracer methods based on their radioactivity. Preparation of protactinium and americium in a metallic form in very minute amounts has been accomplished. The separation of these elements from each other and from the rare earth fission products has involved detailed studies of methods. The separation problem has been quite pronounced in the case of the newer man-made elements, 95, 96, and 97. These studies have resulted in marked advances in the technique of ion-exchange.

Extracting Plutonium

The immediate practical value of the improved separation techniques is in solution of the very pressing problem of extracting plutonium from the uranium slugs used in the Hanford reactors.

AEC chemists consider the plutonium separation the most difficult problem ever undertaken on a large scale. Not only is the amount of the metal in the slugs very minute, but it is mixed with 40 or more elements from which it must be separated.

Typical problems which must be faced include the dissolving of plutonium, precipitation from dilute solution, extraction of plutonium and uranium compounds from aqueous solution by non-aqueous solvents, and the preparation of plutonium metal from its salts. Interference effects resulting from the presence of 40 to 50 other elements, especially the rare earths, which are not commonly encountered in chemical separations, must also be determined.

Rare Earth Elements

In an attempt to solve some of these problems, much research has been carried out on the chemistry of the 14 rare earth elements. Prior to 1940 little work had been done in this field due to the lack of practical value of the elements and the difficulties involved in separating them.

As a result of much fundamental, experimental, and theoretical chemistry, AEC chemists developed a refined ion-exchange process to effect the separations. In this process, a solution containing rare earth elements is allowed to flow downward through a long thin vertical tube which is packed with resin. This solid resin removes the various elements from solution by the process of ion exchange.

After the rare earths are absorbed on the resin, a weakly acid sodium citrate solution is poured through the column. Under the action of this solution, the grip of the resin upon the rare earths seems to be loosened, but in a slightly different degree for each rare earth element present.

As the solution passes down the tube the rare earths begin to be carried with it, but at different rates, so that the solution as it emerges from the bottom of the column is found to carry one rare earth for a time, and then another for a time, then a third for a time, and so on. By collecting these fractions in different vessels, a separation of the component rare earth elements is effected.

The chemist, who must be protected by several feet of concrete, views his materials with mirrors and periscopes and carries out his work by remote control. Use of the ion-exchange process was instrumental in discovering the rare earth promethium (element 61) and also in producing the first appreciable quantities of technicium (element 43). This ion-exchange reaction has now been applied to other fields where separations are difficult, such as the nucleic acids.

Complex Absorption Spectra

The determination of how atoms interact to form molecules is an important objective. Because of the many shell electrons involved in the interactions of most atoms, absorption spectra are quite complex. The complexity often precludes the making of basic theoretical calculations based on studies of such spectra. For this reason, the relatively simple hydrogen molecule is the object of considerable spectroscopic study.

Now that tritium (hydrogen 3) is available, comparison studies and interpretations may be made from studies of various combinations of hydrogen, deuterium, and radioactive tritium. Recent attempts to photograph hydrogen spectra containing tritium have been quite successful.

One of the major problems in the high temperature work is to find refractory materials capable of withstanding the extremely corrosive effects of most molten metals. Research established that certain cerium sulphides and sulphides of other metals had desirable properties.

Progress has also been made in this field by combining predictions based on thermodynamic principles with known data as to the behaviour of materials on the surface of the sun and stars and the study of geological processes which took place at elevated temperatures.

GERMAN UNDER-WATER PAINTS

Useful Findings of Wartime Research

THE important German research on under-water paints during the war, which was greatly intensified by increased submarine activities, is the subject of a report recently issued by an Allied Commission of Investigation. It deals largely with the paints used by the German OKM (Oberkommando der Marine).

In *Farbe, Lacke u Anstrichstoffe* (1950, *4* (2), pp. 39-42) this report is supplemented and criticised by P. Colomb. He refers first to a series of articles by Dechaux on sea-water paints (*Peint. Pigm. Vern.*, 1942, January, October, November; *La Chim. des Peint*, 1948, October) in which the double action of sea-water is stressed, *e.g.*, similar to that of two liquids of *p*H 4 and 11.

Red lead is of little use, he maintains, unless care is taken to use the right kind of formulation to avoid porosity. Colomb had previously reported that the use of chlorinated rubber as binder, in a 3-months' test, resulted in a rise rather than a fall in *p*H.

Before the war, Schweinfurt green (copper metarsenite and acetate) was largely used in Germany as a base for underwater paints, but later, with the intensification of submarine activities, there was considerable difficulty in obtaining sufficient raw materials of the right kind. This was emphasised in the Allied report. In particular, rosin (colophony) was scarce and an attempt was made to obtain substitutes from tall oil. Another shortage was glycerin.

Type G 401

The composition of the anti-corrosive paint Type G 401 is described in the report. The zinc oxide used contained about 6-7 per cent lead, and the iron oxide red was synthetic. The lacquer medium, intended for gray and reddish-brown paints, contained, in parts: 380 Albertol resin 369 Q, or a mixture of this with 347 Q; 147 xylol; 73 tetralin; 67 Syntol T; 190 tetrachlornaphthalene (Haftax); and 190 Nibren wax (I.G.). This was sometimes further diluted with xylol.

Viscosity of the paint was 45-50 sec. in the German standard (DIN) beaker 4 at 20° C. It was dust-dry in one hour and completely dry in 6 hours. The formulation might also include titanium white.

The report also contains the recipe for anti-fouling paint No. 822D, in which the medium used was lacquer 802. The correct formulation of the lacquer is given as (in parts): 40.7 rosin, 8 special resin, 31.2 copper naphthenate—in 75 per cent benzine solution, 7 xylol, 3.3 tetralin, 1 triethanolamine, 12.2 coal tar pitch solution, 83 special medium L30.

Viscosity of the lacquer medium was 25-28 (German standard at 20° C.) and that of the paint was again 45-50. The paint contained talc, which was often used in German war paints to compensate the lack of chromates and improve adhesion.

Red Lead as Pigment

Dr. Kurt Herbert is stated to retain faith in red lead as pigment, but Colomb disagrees and cites support by English and American paint experts. The criticism assumes that the pigment is used with linseed oil with a special binder. His own experience and that of the German railways has shown that red lead makes an excellent paint, if used with an alkyd resin and dehydrated castor oil, with some natural heavy spar (baryta) as filler.

Colomb doubts whether chlorinated rubber was used to any great extent, owing to lack of suitable raw material. Warnecke and Böhm employed a resin known as Ikarol, but this was, in fact, Albertol 347, a condensation product of rosin with diphenyl propane and *p*-formaldehyde.

The best results were generally obtained by using modified phenol resins, by-products of synthetic fatty acid manufacture, cumarone-indene resins and coal tar pitch as binders. The principal anti-fouling agents were pure electrolytic copper and the mercury-copper mixture. The value of tetrachlornaphthalene in these formulations is also noted.

It is pointed out that, in England and America, copper and mercury paints retain their dominant position and zinc chromate is receding in importance. In France, the principal basic materials appear to be Schweinfurt green and other arsenious substances, as before the war.

Saudi-Arabian Oil

According to latest estimates made by the Arabian-American Oil Company, oil production in Saudi-Arabia will average about 463,000 barrels per day in 1950—slightly less than the average production for 1949.

Toxic Factor in Agenised Flour

Steps Which Led to its Recent Isolation

by R. W. MONCRIEFF

QUITE recently, the toxic factor in agenised flour has been isolated, apparently independently, by three groups of workers. Its chemical identity has not yet been precisely determined, but some general indications of its nature have been elucidated.

Canine hysteria, running fits or "fright disease," has been observed in the dog population since 1916 in the U.S.A. and since 1924 in the U.K. The disease is characterised by the occurrence of fits resembling those of epilepsy and, since it was first observed, its incidence has greatly increased; the veterinary aspects of the subject have been discussed by Heweston.[1]

First Approach

Considerable attention was paid to the disease, and experimental work soon showed that its onset was closely connected with the diet of the animal. A significant advance was made by Arnold and Elvehjem[2], who showed that fits were produced in young dogs if given a diet prepared from wheat flour and meat scrap processed by dry heat. They found, too, that the symptoms could be alleviated by adding an unheated protein to the ration.

The next important step was an observation (unpublished) by Parry that commercial wheat gluten rapidly produced intense symptoms of hysteria in dogs. This was followed up by Wagner and Elvehjem[3], who came to the conclusion that the cause of the disease lay in some toxic factor in the wheat products. This was a distinct advance as, formerly, it had been more usual to ascribe the trouble to a deficiency of some factor in the diet. This was the first clear appreciation of the fact that the disease was, in fact, due to the presence of some poisonous material, and that this was to be found in wheat flour.

Considerably earlier than this, records Sir Edward Mellanby,[4] the idea had developed at the Nutrition Building of the National Institute for Medical Research that the cause of canine hysteria lay in the bread portion of the diet, and it had been possible to stop the onset of fits by changing the source of the bread, or by substituting oatmeal for a considerable proportion of the bread. A miller, to whom samples of flour, suspected of being responsible for outbreaks of canine hysteria, were shown, observed that all these samples had been heavily bleached and probably "improved." This opened up the line of attack which eventually led to the solution of the problem.

Attention was immediately directed to those chemical agents used in the preparation of flour, and of these the following possessed both bleaching and "improving" properties: chlorine, chlorine and nitrosyl chloride (beta gas), nitrogen trichloride (agene), and chlorine dioxide (addage). It was known that of these substances agene was most widely used; indeed, it was estimated that 90 per cent of the flour milled and used for bread-baking in the U.K. had been agenised; *i.e.*, it had been treated with nitrogen trichloride gas. As this processing was known also to affect the gluten of wheat, it was natural that it should be the first to be investigated.

Commercially agenised flour—flour that would normally have been made into bread for human consumption—was used for the tests along with untreated flour. The diet used was one known to be adequate and compatible with normal growth; it contained cereal (agenised in the tests, untreated in the controls), lean meat, arachis oil, bakers' yeast, salt and vitamins A, C and D. The cereal part of the diet was steamed for 90 min. at a pressure of ½ lb.

Conclusive Results

According to Mellanby[4], it soon became evident that the hysterical conditions could often be produced by the above diet if it contained the treated flour, but not if it contained the untreated flour, and again, changing the flour in the diet of a badly affected animal to the untreated variety resulted in a sudden stoppage of the fits; but the animal might remain nervous and shy for a period. Experiments confirmed these findings.

The agenised flours used in the investigation were not specially prepared, overbleached specimens, but had all received a normal commercial processing. The behaviour of the dogs suggested that the agenised flour, or rather the toxic constituent which it was believed to contain, had affected the central nervous system of the animals. *Post-mortem* examination of those animals which died during test failed to reveal any lesion which could be regarded as the essential one. It at once became clear that investigation should be made as to the effect on other animals, and particularly on human beings, of flour that had been treated with nitrogen trichloride.

In a later paper Mellanby[5] showed that the portion of the flour which was changed by processing with nitrogen trichloride was the gluten. The gluten was prepared by making the flour into a dough, putting this in muslin and washing out the starch under a cold water tap. It was soon found that if gluten prepared from agenised flour was added to a dog's ration, the animal developed hysteria in a matter of four or five days. The substitution of gluten prepared from untreated flour for that made from agenised flour soon cured the animal.

It was thought that as the gluten contained a considerable proportion of the fatty content of the flour, the toxic factor might reside in the fatty part of the gluten, but this proved not to be the case, as ether extracts were harmless, and toxic gluten was still toxic even after having been extracted with alcohol and ether.

It was abundantly proved that the cause of canine hysteria lay in the gluten of agenised flour, and Mellanby[5] states that a film illustrating the effect of gluten from agenised and untreated flour on the production and cure of canine hysteria was shown at the Ministry of Health on January 20, at Vanderbilt University on April 1, and at the International Physiological Congress in July 1947.

Varying Effects

Mellanby's original experiments[4] were made on dogs, and in his later paper[5] he reported that ferrets were similarly susceptible to the effects of agenised flour. They became drowsy and ill-tempered, had fits of charging hysterically round their cages, and when severely affected, developed true epileptiform fits. Rats appeared not to develop nervous symptoms when fed on agenised flour, but it is, of course, not impossible that natural selection has had something to do with this.

Even among dogs, which are especially susceptible to the effects of agenising, the susceptibility varies from litter to litter and even from one animal to another. Very possibly similar variations existed in the original rat population, and during the last 25 years those individuals that were least affected by agenised flour have thriven and multiplied. Newell *et al*[6] have shown that cats are affected, and Radomski *et al*[7] that rabbits also can develop symptoms of hysteria when fed on a diet containing agenised flour. Moran[8] reported that the guinea pig was unaffected by agenised flour, but that the life cycle of the flour beetle (*Tribolium confusum*) was lengthened by it (*i.e.*, development was retarded).

Human Disorders

The obvious question arises as to the effect that the agenising of flour has had on humans in the last 25 or 30 years. Probably most of the bread we have eaten has been made from agenised flour, and it seems not unreasonable to think that some of the nervous disorders which have been prevalent in that period may have been at least partly due to the use of flour so treated. Cases of idiosyncrasy have probably arisen and it seems likely that some individuals may have been very detrimentally affected.

It is impossible now to gauge what (if any) ill effects have resulted. That there are some grounds for believing that these may not have been inconsiderable is evident from the abolition of agenising in the U.S.A. some years ago, and the more tardy action taken in the U.K. Some kinds of flour, notably wholemeal varieties, appear never to have been agenised. Now that the process is being discontinued, it will be interesting to see if nervous disorders become less prevalent among the human population.

Moran[8] published a long paper in 1947 on work which he had carried out at the Cereals Research Station (St. Albans) of the Research Association of British Flour Millers. In the main, his work confirmed that of Mellanby. He investigated the possibility of the agenising process destroying some essential nutritional factor, but concluded that this is unlikely and that the harmful effects of agenised flour result from the presence therein of some toxic factor. He also showed that when amounts of nitrogen trichloride, larger than those that would be used in commercial practice, are applied to flour, the resulting flour can produce canine hysteria within 24 hours.

Moran does contribute something new in an investigation of the part of the wheat that is acted on. He points out that the reaction of the nitrogen trichloride is with the protein of the wheat—the fraction that Mellanby had described as gluten—and that it is not with a sterol, because the evaporated chloroform and acetone extracts of agenised flour are quite harmless, and they would contain the sterol fraction.

It was pointed out by Moran that the proteins of wheat are not well defined, and he therefore carried out experiments on the treatment of other proteins with nitrogen trichloride; those he chose were casein, gelatin and zein. Treated gelatin when fed to dogs induced slight running fits; it had a positive, although only a slight, effect. Treated casein and treated zein both produced convulsive fits in about 24 hours. Evidently the toxic factor which results when wheat flour is agenised is also formed when other proteins, such as casein and zein, are treated with nitrogen trichloride.

Amino Acid Effects

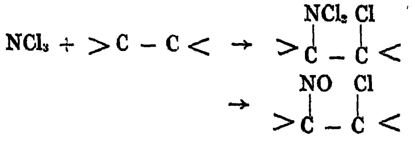
Moran was unable to say to which of the amino-acids present (combined) in the protein the toxic factor was due, but he pointed out that zein is said not to contain glycine, tryptophane and lysine in significant amounts, so that perhaps one might rule out these three amino-acids. Moran did, however, also make the tentative suggestion that glutamic acid might possibly be the amino-acid involved. This acid predominates in cereals and in casein, but is present in only small amounts in gelatin, circumstances which agreed with Moran's experimental observations described above. He remembered, too, that the feeding of glutamic acid to epileptic children had recently been found to have beneficial results.

It was also pointed out by Moran that nitrogen trichloride could act chemically either as an oxidising agent:

$$NCl_3 + 3H_2O \rightarrow NH_3 + 3HOCl \rightarrow NH_4Cl + 2HCl + 3O$$

$$\text{or } 2NCl_3 \rightarrow N_2 + 3Cl_2$$

or as an addition agent at a point of unsaturation:



$$NCl_3 + \,>C-C<\; \rightarrow \;>\overset{NCl_2}{\overset{|}{C}}-\overset{Cl}{\overset{|}{C}}< \;\rightarrow\; >\overset{NO}{\overset{|}{C}}-\overset{Cl}{\overset{|}{C}}<$$

There is some evidence that in its action on flour, nitrogen trichloride exercises both functions, oxidation and addition.

A paper by Moran *et al*[9] describes the concentration of the toxic factor in agenised zein. The concentration method consists of several stages, and as these are passed the toxic dose becomes lower and lower, indicating that the toxic factor is becoming more and more concentrated. The starting material is zein that has been treated with nitrogen trichloride, and the way in which the toxicity increases has been represented in a table.

It is evident that this method of concentration has yielded a product that is 2500 times as toxic (and therefore as concentrated) as the original agenised zein. Toxicity was assessed by measuring the minimum quantity that would give rise to convulsive fits in rabbits. The table shows:

Step	Fraction	Toxic Dose gm.	Concentration
1. (Control)	treated zein ...	5	—
2. Pancreatic digestion	dialysate ...	1.5	3
3. Butanol extraction	aqueous phase	1.0	5
4. Phenol extraction ...	phenol phase	0.6	8
5. Acid hydrolysis and butanol extraction	aqueous phase	0.3	17
6. Charcoal and acetone precipitation ...	precipitate ...	0.15	33
7. Electrodialysis ...	middle compartment ...	0.030	170
8. Iron-exchange displacement ...	end fraction ...	0.004	1250
9. Acetone precipitation and silica gel	—	0.002	2500

This work was followed by another paper[10] by the same school. Modifications to their original concentration method were made, and it was found possible to isolate the toxic factor in crystalline form—it proved to be a material that could be recrystallised from aqueous ethanol without disturbing its degree of toxicity; it melted sharply with decomposition at 232° C. (uncorr.); it had an appreciable sulphur content.

The behaviour of the crystalline material with ninhydrin is not quite typical of amino-acids—on filter-paper it gives with ninhydrin on heating a yellow colour turning through brown to purple *only on further heating.* As a further proof that this isolate was in truth the toxic factor of agenised zein, it was found that corresponding material was entirely absent from "unagenised" zein, purified in precisely the same way.

Confirmation

Moran *et al*[11] later reported that the isolate prepared as described above had given satisfactorily toxic results when tested on a dog. A 10-kg dog given 20 mg crystalline material (two parts toxic factor per million body weight) developed all the symptoms of hysteria, including running and barking fits, in less than 18 hours, followed by violent convulsive fits. This confirmed that the crystalline material was, in fact, the toxic factor of the agenised zein.

Ultimate chemical analysis of the crystalline material agreed most closely with an empirical formula of

$$C_5H_{12}N_2SO_3$$

and as the "found" molecular weight was 200, it may be that the above empirical formula is also the molecular formula, in which case the molecular weight is 180. Treatment with Raney nickel gave α-aminobutyric acid, by desulphurisation, a reaction which suggested that methionine is implicated as the reactive centre. Some support for this view was to be found in the fact, reported by Heathcote[12], that the toxic effect of the crystalline substance on *Leuconostoc mesenteroides* P 60 can be reversed by the addition of excess methionine to the medium.

There appears to be some evidence that the crystals may be a mixture of stereoisomers, of which one is toxic and the other non-toxic. There is, of course, nothing unusual in optical antipodes having very different physiological activities; ascorbic acid and testosterone are two examples of such substances.

A recent paper[13] by Drs. Campbell and Work and Sir Edward Mellanby from the National Institute for Medical Research and Nutrition Building, Mill Hill, has described the isolation from agenised flour of the toxic factor in a crystalline form. This substance has proved to be 33,000 times as toxic as the original flour from which it was isolated, and its enormous toxicity may be inferred from the fact that a quantity as small as 3 mgm., when fed to a ferret over a period of five days, produced severe epileptiform fits. A similar quantity fed in one dose is sufficient to kill the animal; by the same reckoning one ounce of the toxic material would kill 10,000 ferrets.

Same Constitution

Campbell *et al* believe that the toxic factor which they have succeeded in isolating has the same constitution as that which Moran *et al* have isolated from zein, as described above. They believe, too, that both substances are identical in constitution with a toxic crystalline isolate with which Dr. Reiner, of Wallace & Tiernan, Ltd., has supplied them.

This last material was obtained from zein that had, like that from the St. Albans group, been treated with nitrogen trichloride. It appears, therefore, that the toxic constituent of flour that has been treated with nitrogen trichloride has been isolated independently by three groups of workers, although two of these groups have used zein, and the third has used flour, as raw material.

The method used by Campbell *et al* for isolating the toxic material from agenised flour was as follows: Wheat flour was agenised with ten times the quantity of nitrogen trichloride used in commercial practice. At this stage 100 gm. (less than 4 oz.) of the flour, when fed to a ferret over a period of three days, proved to be toxic. The gluten, in which the toxic factor was known from previous work by Mellanby[5] to reside, was isolated from the flour, and was digested first with pepsin and then with trypsin, both of these substances being hydrolysing agents.

Chemical Method

The products from this treatment were subjected to dialysis, and the part that dialysed was given a further hydrolysis, this time with concentrated hydrochloric acid; it was then electrodialysed. The neutral electrodialysate was treated with active carbon to remove the aromatic amino-acids, and the residue was passed down an adsorption column of Zeocarb 215. This adsorption separation technique was successful, and a fraction was isolated from the column which had a very high toxicity. At this stage the toxic factor had been greatly concentrated, but had not been isolated; in fact the concentrate still contained 15 different amino-acids. Final concentration and separation were achieved by selective adsorption on a chromatographic paper column.

The precise nature of the toxic material is still unknown, but it seems to have some not very distant connection with the amino-acid methionine. Campbell *et al* thought it likely that the toxic substance would prove to be a peptide, in which case it should, on hydrolysis with a concentrated solution of hydrochloric acid, break down into a number of amino-acids. When, in fact, the substance was hydrolysed and the hydrolysate was examined chromatographically, it was found that although several amino-acids could be detected, there persisted for a long time a portion of the unchanged toxic material. This degree of resistance to the action of hydrochloric acid is much greater than one would expect in a peptide.

The following amino-acids were found in the hydrolysate: homocysteic aicd, α-aminobutyric acid, methionine sulphoxide, methionine sulphone, and homoserine. These strongly suggested again that the toxic factor must be similar in constitution to methionine. Furthermore, both the toxic factor and methionine, when desulphurised by the action of Raney nickel, yield α-aminobutyric acid.

It is, however, known from the work of Silver *et al*[14] that when methionine is treated with nitrogen trichloride, the toxic factor does not result. Furthermore, when Campbell *et al*[13] treated the under-noted amino-acids with nitrogen trichloride, the toxic factor again failed to appear: methionyl-glycine, carbobenzoxymethionyl methionine amide, and carbobenzoxymethionyl methionine. The characteristic crystalline appearance of the toxic factor suggests that it is probably one simple chemical entity, and it is clearly closely related to the sulphur-containing amino acids.

Among the recent annotations in the *Lancet* is one[15] in the nature of an obituary on agenised flour. It relates how, after Mellanby's discoveries, the U.S. and Canadian Governments prohibited its use in favour of chlorine dioxide, and how in this country a committee was set up under the chairmanship of Sir Wilson Jameson, and including representatives of the Ministries of Food and Health and of the Medical Research Council and the milling industry, to consider the whole problem.

Official Reactions

According to a statement issued by the Ministries of Health and Food at the end of January this year, this committee was unable to find any evidence that agenised flour is in any way toxic to man. It is stated that experiments carried out both here and in the U.S. have failed to produce toxic symptoms, even when heavily treated flour has been fed at a high level. Nevertheless, the committee has decided that its use should be discontinued.

It is suggested that chlorine dioxide should be used as an " improver " instead of nitrogen trichloride, and it is stated that exhaustive tests on flour treated with this improver have shown that it causes no toxic symptoms in either man or animals. The statement concludes with the reassuring remark that the public can be assured that the present methods of treatment of flour, which have been in operation in this country, the U.S.A. and Canada for some 25 years, and which include agenisation, have not proved to be injurious in any way to human health.

Nevertheless, it is felt there must have been some cases of idiosyncrasy, cases of individuals who were much more susceptible than most of us to the toxic factor. The change-over from nitrogen trichloride to chlorine dioxide—which latter substance is bought with dollars—will not be made *in toto* at once, but when it has been made, it will be of great interest to ascertain if there are any discoverable differences in the health of the population.

In conclusion, perhaps reference may be made to a letter[16] recently addressed to the editor of the *Lancet*, in which the view is put forward that "improvers" are not necessary to safeguard baking qualities. " They are merely artificial means to speed up the natural maturing of flour, at the same time bleaching it and giving a whiter-*looking* loaf."

REFERENCES

[1] H. R. Hewetson, *Vet. Rec.*, 1936, *48*, 1202.
[2] A. Arnold and C. A. Elvehjem, *J. Amer. Vet. Med.*, 1939, *95*, 303.
[3] J. R. Wagner and C. A. Elvehjem, *J. Nutrition*, 1944, *23*, 431.
[4] E. Mellanby, *Brit. Med. J.*, 1946, 2, 885.
[5] E. Mellanby, *ibid.*, 1947, 2, 288.
[6] G. W. Newell, T. C. Erikson, W. E. Gilson, S. N. Gershoff and C. A. Elvehjem, *J. Amer. Med. Assn.*, 1947, *135*, 760.
[7] J. L. Radomski, G. Woodward and A. J. Lehman, *J. Nutrition*, 1948, *36*, 15.
[8] T. Moran, *The Lancet*, 1947, *253* (2), 289.
[9] H. R. Bentley, E. E. McDermott, J. Pace, J. K. Whitehead and T. Moran, *Nature*, 1949, *163*, 675.
[10] *Idem.*, *ibid.*, 1949, *164*, 438.
[11] *Idem.*, *ibid.*, 1950, *165*, 150.
[12] J. G. Heathcote, *Lancet*, 1949, *257* (2), 1130.
[13] P. N. Cambpell, T. S. Work and E. Mellanby, *Nature*, 1950, *165*, 345-6.
[14] M. L. Silver, E. P. Monahan, and J. R. Klein, *Proc. Soc. Exp. Biol.*, N.Y., 1947, *66*, 410.
[15] Annotations, *Lancet*, 1950 *258* (1), 219, 227.
[16] C. P. Allinson, *Lancet*, 1950, *258* (1), 329.

SPAIN'S KAOLIN INDUSTRY

THE rate of development of exploitation of Spanish kaolin is reflected in part by the fact that in 1948 Spain's imports of this material amounted to some 10 kg. Prior to the Civil War, Spanish kaolin imports totalled 20-25 tons a year.

These facts are recalled by C. Coma Diaz, reviewing in *ION* (December 1949) recent progress in the recovery and use of Spanish kaolins. Fairly large deposits are located in Galicia at Pontevedra, in the north of Lugo province and other parts.

Exports of kaolin from Spain have increased in recent years, although they amounted only to 689 tons in 1948. Production capacity at present is said to be in excess of demand.

Some account is given of composition and of associated minerals which include montmorillonite (bentonite), anauxite, etc. Analysis shows rather wide divergence in composition, especially in moisture content. The principal constituents, with small percentages of Fe_2O, MgO, K_2O, and Na_2O, are given in the following table:

Source	SiO_2	Al_2O_3	Water
S. Martin de Montalban (Toledo)	56.85	28.14	10.6
,, ,, ,,	47.10	37.11	13.4
Otero de los Herreros (Segovia)	49.50	35.86	9.78
Valdeprados (Segovia) ...	47.78	39.20	8.82
Liria (Valencia)	55.68	31.10	9.40
Liria (Valencia) (other deposits)	58.62	32.36	5.19
Lage (Pontevedra) ...	45.40	36.63	11.76
Catoira (Pontevedra) ...	47.13	34.56	14.33
Sierra Guadarrama (Madrid)	50.91	31.58	13.59
Melilla	28.18	34.20	31.15

These samples were in most cases crude clays prior to washing, and they compare very favourably with imported material. Some of them have no titanium oxide and in most the content of iron oxide is less than 1 per cent.

Technical Publications

CHARACTERISTICS and applications of anhydrous borax, $Na_2B_4O_7$, are described in a leaflet just issued by Borax Consolidated, Ltd., London. In vitreous enamel and pottery frits an increase in output of frit up to 30 per cent is claimed with Dehybor anhydrous borax, while in the glass industry it melts quietly and without intumescence at about 741° C., largely overcoming the mechanical loss through expansion likely to occur with hydrated borax.

* * *

NOVEL methods of presenting various subjects were employed at the second training conference of the British Iron and Steel Federation, a full report of which has just been issued. "Training the Junior Operative" was presented as a symposium with rehearsed interruptions; "Training the Foreman" was a dramatised committee discussion and "Training the Clerk" a duologue. There were 12 discussion groups. Voting showed that while the majority appreciated these new techniques, a substantial minority did not.

* * *

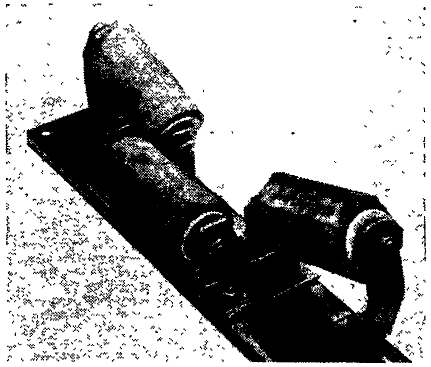
FULL proceedings of the conference on safety in chemical works which aroused considerable interest when it was held at Harrogate in October last year, have now been published in book form and are available not only to members of the Association of British Chemical Manufacturers but to anyone interested. Subjects discussed were: Industrial Hazards (Dr. J. Gwynne Morgan); Safety Aspects of Chemical Plant Design (J. E. Braham); Principles of Safety Organisation (H. R. Payne); Accident Records (H. G. Winbolt); and Clearance Certificates (A. G. Palmer). The book now available from the ABCM (5s.) presents all these papers in full.

* * *

INCREASED sales and production of fluorocarbon-type thermoplastic have enabled the M. W. Kellogg Co., New Jersey, U.S.A., to reduce prices by about 50 per cent. Low-density moulding powder now costs $13.75 lb. compared with $26 lb. for the same quantity. The Kellogg Company has issued a new technical bulletin, on physical and mechanical properties of the material, incorporating experience and data of further tests and industrial applications.

* * *

RECORDS on the volume and value of external trade of Great Britain are given in a new statistical bulletin *Report on Overseas Trade* prepared by the Statistics Division of the Board of Trade. Much valuable information is given in compact form by re-sorting and classifying material from the trade returns and other sources. The report will be published monthly by the Stationery Office (price 1s.).



[Courtesy, Richard Sutcliffe, Ltd

New rapping roller (right) for clearing conveyor belts, particularly necessary where fine materials are belt-carried

* * *

WHAT is in itself almost a small reference library on water treatment has been issued in a series of pamphlets by the Permutit Co., Ltd., London. Aspects covered include: properties and instructions for using cation and anion exchange materials; ion exchange materials in process industries; and ion exchange in research and industry and its miscellaneous applications.

Heterogeneous Catalysis

A general discussion on heterogeneous catalysis, organised by the Faraday Society, is to be held at the New Arts Theatre, University of Liverpool from April 12-14. Sir John Lennard Jones will preside. As an introduction, the Spiers Memorial Lecture, the first to be delivered since the war, will be given by Professor H. S. Taylor, professor of physical chemistry at Princeton University, who will speak on "Surface Catalysis: Retrospect and Prospect."

Forty-two papers have been prepared under the following main headings: theories of adsorption and properties of surface layers; adsorption and catalysis on metals; adsorption and catalysis on oxides; and techniques.

"GLASSWARE MONOPOLY"

Health Minister's Changes

CRITICISM of the glassware manufacturers was made in the House of Commons last week by Mr. Aneurin Bevan.

During the debate on supplementary estimates for the National Health service the Minister of Health, after dealing with the increased costs of hospital services and denying that these were due to maladministration, made this statement:—

"The supply organisation of the Ministry of Health attempted to get bulk purchase of glassware in hospitals. We asked for tenders from manufacturers in Great Britain. We could get no tenders because they said 'We always sell through retailers.'

"We asked the retailers, but they said 'We do not tender because we sell at the price fixed by the manufacturers.' So we had to get them from Germany to break the monopoly. As a consequence we have saved a large sum of money, even after paying import duty."

The British Chemical Ware Manufacturers' Association said that this statement by Mr. Bevan gave rise to certain misapprehensions which it wished to correct. The association issued the following statement:—

"In the first place, there was and is no difficulty in obtaining the bulk of the general types of glassware required by hospitals direct from the manufacturers. The Ministry of Health invited tenders for scientific glassware from the manufacturers, who informed the Ministry that ample supplies were available through the normal trade channels.

"The value of the tenders received by the manufacturers would have made it impossible for the Minister to have saved a large sum of money by importing from Germany."

PARLIAMENTARY TOPICS

State Grants for Technology

DETAILS of arrangements to assist Universities in setting up post-graduate schools in various branches of technology were the subject of a question by Mr. J. M. C. Higgs to the Chancellor of the Exchequer. In a written answer, Sir Stafford Cripps stated that at the suggestion of the University Grants Committee a number of universities were instituting or expanding post-graduate courses of advanced instruction in technological subjects, which included the three main branches of engineering, metallurgy, mining and chemical engineering. To meet the cost of these courses additional recurrent grants had so far been promised of the following amounts: 1949-50, £15,500; 1950-51, £42,000; 1951-52, £57,000. These special arrangements were additional to the normal programmes of post-graduate study being carried on by the universities with the aid of the quinquennial grants announced in 1947. Other courses were under consideration.

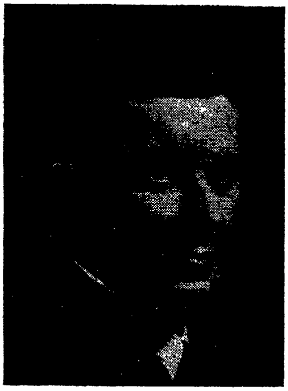
UNDERGROUND gasification was again the subject of questions in the House of Commons last week when Mr. Roland Robinson asked the Minister of Fuel and Power what progress was being made and in view of experiments already completed in America, whether any interchange of information with the U.S.A. had been arranged. Mr. Noel-Baker, replying, said the boring at Newman Spinney, near Chesterfield, had begun well, and although it was too early to forecast the result, it was hoped to solve some of the technical problems. The American experiments had been attended by some of our experts, and it was hoped to work in close relationship with the U.S.A. and with Belgium, where similar work had been undertaken.

No Ready-Made Training Schemes—Sir Robert Robinson

THE view that there is no simple solution which would satisfy all the needs recognised by the current desire to increase facilities for technological education was expressed last week by Sir Robert Robinson. The president of the Royal Society told members of the Oil and Colour Chemists' Association—whose principal guest he was at the annual dinner in London—that Sir Henry Tizard is shortly to call together a body of influential people to discuss technological education and it was important that the oil and colour chemists' experience in the matter should be made available in these discussions.

There was yet insufficient data to form any useful conclusions, but of one point he was sure. It was an extremely complex question and the solution would differ from industry to industry. It would need to be a fairly gradual growth, a natural one and not something suddenly brought into being.

· PERSONAL ·



Dr. E. H. T. Hoblyn, whose appointment as director of the British Chemical Plant Manufacturers' Association was announced in our last issue

THE appointment of DR. W. D. SCOTT as deputy managing director of Monsanto Chemicals, Ltd., was announced last week by the managing director, Mr. E. A. O'Neal, Jnr. Dr. Scott joined Monsanto from the Anglo-Iranian Oil Company as a research chemist in 1936. In 1937 he became responsible for Monsanto's technical development and service. In 1942 he was appointed chief chemist in charge of research, development and patent activities. He became a director of the company in 1948. Dr. Scott is an associate of the Royal College of Science, where he obtained his D.I.C. and Ph.D., and a graduate of London University.

MR. C. B. WOODLEY, who has completed this month 25 years' service as general secretary of the British Association of Chemists, is to be released for a time from his secretarial duties in London to tour some of the Northern branches of the association. He intends to promote better liaison between the various sections and headquarters. On March 31 he will meet Leeds members at the Hotel Metropole, and on April 1 he will be received by members at the Grand Hotel, Sheffield.

MR. W. G. B. GRANT has been appointed to manage the new Glasgow branch office, at 158 Cyde Street, C.1, of the Clayton Aniline Co., Ltd., Manchester. The firm's representation in Scotland was previously in the hands of MR. J. M. GIFFORD (A. W. Wardrop & Co.), who, after a long period of co-operation with the Clayton Company, has decided to retire from active participation in the dyestuffs business.

The names of delegates from the United Kingdom, attending the fifth meeting of the International Tin Study Group, currently being held in Paris, were announced last week by the Ministry of Supply. They are: MR. W. G. FERGUSON, Ministry of Supply, Messrs. S. CAHN, S. WAITE and P. O. WILLIAMS, non-official advisers, and MISS N. K. FISHER, Board of Trade.

MR. R. J. P. WILLIAMS, of Wallasey, a student of biochemistry at Merton College, is one of 85 students from 25 countries who have been granted fellowships by Rotary International in Chicago. The fellowship will enable Mr. Williams, who has been studying at Merton College for six years, to complete his studies in Uppsala, Sweden.

The first award of the W. H. A. Robertson Medal of the Institute of Metals has been made to MR. W. J. THOMAS and MR. W. A. FOWLER for their paper on "Some Technical Problems Influencing Production Economy in the Rolling of Aluminium" (the Institute's *Journal*, 75, 921-948). The authors are assistant managing director and production manager of manufactured materials, respectively, of The British Aluminium Co., Ltd. The council of the Institute has gratefully accepted an offer by the directors of I.C.I., Ltd., of a donation sufficient to provide an annual medal award as a memorial to Dr. Walter Rosenhain, F.R.S., distinguished British metallurgist and past-president and Fellow of the Institute of Metals.

At the recent annual general meeting of the British Laboratory Ware Association, the following officers were elected for the period ending January 31, 1951:—Chairman: MR. J. E. C. BAILEY (Baird & Tatlock (London), Ltd.); vice-chairman: MR. J. S. TOWERS (J. W. Towers & Co., Ltd.); hon. treasurer: MR. N. MCKINNON WOOD (Griffin & Tatlock, Ltd.); secretary, MR. W. H. ADAMS. All members of council who had served in 1949-50 were re-elected. MR. S. J. KENNEDY (Baird & Tatlock (London), Ltd.) was re-elected convener of the technical committee.

(continued overleaf)

OBITUARY

Sir Norman Haworth

THE death occurred on March 18 of SIR NORMAN HAWORTH, distinguished for his research on carbohydrates and vitamin C, for which he shared the Nobel Prize for chemistry in 1937.

Walter Norman Haworth was born in 1883 and studied at the universities of Manchester and Göttingen. After being senior demonstrator in chemistry at the Imperial College, South Kensington, he became reader in chemistry at St. Andrews.

In 1920 he became professor of chemistry and director of the chemistry department University of Durham. Five years later he was appointed to the chair in chemistry, and director of the department of chemistry at Birmingham University, with which he was associated for many years, from 1947-48 as vice-principal.

Professor Haworth did outstanding work on substances connected with the production of immunity against disease. One fundamental contribution was the determination of the chemical structure of pure vitamin C and he showed that it could be produced cheaply on a commercial scale. He bestowed the patent rights on the DSIR. In 1942 he was awarded the Royal Medal of the Royal Society for his fundamental contributions to organic chemistry, particularly to the constitution of the sugars and the structure of polysaccharides

The professor was president of the Chemical Society from 1944 to 1946, and was knighted the following year, when he was also appointed chairman of the Chemistry Research Board.

Although his name was not directly associated with the development of the atomic bomb he was one of the signatories of the Atomic Scientists' Association's memorandum on international control of atomic energy submitted to the Atomic Energy Commission of the United Nations.

Professor Haworth received many honours, including the Davy, Royal and Longstaff Medals. He was elected an FRS in 1928 and became a vice-president of the Royal Society in 1948. He was honorary D.Sc. of Belfast, Zürich and Oslo, honorary Sc.D., Cambridge, and Ll.D., Manchester. He was also an honorary member of the Academy of Sciences at Haarlem, Brussels, Munich, Vienna, Finland, Dublin, and of the Swiss Chemical Society.

Lively and energetic, Professor Haworth was an able organiser of research. His achievements were largely due to a devotion to exactitude, his inventiveness in experimental technique and an ability to inspire a research team.

The death has occurred of DR. GEORGE GREEN, a senior lecturer, and for 39 years a member of the staff of the natural philosophy department of Glasgow University. After graduating, he became scientific secretary to Lord Kelvin, with whom he collaborated in some important investigations, and after Lord Kelvin's death he took a large part in preparing the collected edition of his works. During the first world war Dr. Green did pioneering work in sound ranging under Sir William Bragg. He invented a condenser telephone which is a substitute for the loudspeaker in radio, and he was the author of a series of mathematical papers dealing with the solution of problems in the conduction of heat which appeared in the *Philosophical Magazine* over a period of 30 years.

PERSONAL

(continued from previous page)

DR. J. C. DUFF has been appointed head of the chemistry department at Birmingham Central Technical College, in succession to DR. P. D. RITCHIE. Dr. Duff was previously deputy head of the department and, during 30 years' association with the college, has carried out original research on plastic materials.

The appointment is announced of MR. A. IDDLES, president of Babcock & Wilcox Company (U.S.A.), as a director of the British company. He takes the place of MR. A. G. PRATT, who has resigned.

ALDERMAN FREDERICK STATHAM, who had completed 47 years' service with Lever Brothers (Port Sunlight), when he retired three years ago, has been chosen as Mayor of Bebington (Cheshire).

• HOME •

Gas Engineers' New H.Q.

The Institution of Gas Engineers has removed from 1 Grosvenor Place, London, S.W.1, to 17 Grosvenor Crescent, S.W.1. The telephone number is unchanged.

Varnish Blaze

Over 300 gal. of varnish were destroyed by a fire which occurred on March 16 at the works of McArthur and Jackson, Ltd., oil refiners, 98 Dobbie's Loan, Glasgow. The varnish, in two large pans, was being heated by gas jets when it ignited.

Coal Production

Last week's output of deep-mined coal showed a loss of 25,100 tons over the previous week. This was partly offset by an increase of 8000 tons in opencast production. Comparative figures are: Last week: 4,361,100 tons (deep-mined 4,105,800 tons, opencast 255,300 tons); previous week: 4,378,200 tons (deep-mined 4,130,900 tons, opencast 247,300 tons).

Liverpool as a Rubber Centre

Liverpool may become the centre for the storage and distribution of liquid rubber. Last year the Dunlop factory in Liverpool made three times its pre-war volume of latex foam cushioning. This year, with a new extension, it is hoped to increase the pre-war production five-fold. Exports have been increased by 500 per cent and now go to 99 different markets.

Scottish Whaling

Plans for the revival of the whaling industry in Scotland are now going ahead, despite some criticism. Location of the operations has now been fixed on the Island of Harris which was formerly used as a whaling point. It is expected that the company, Scottish Whalers, Ltd., will employ two ships and that after boiling out of the blubber the whale-meat will be cold-stored until marketed.

Another Steel Output Record

Total ingot production of the eight steel works of the West Wales section of Richard Thomas and Baldwins, Ltd., for the week ended March 11 reached 18,954 tons. This exceeded for the second successive week the previous record for these works of 17,976 tons which had been unbeaten since 1937. At Dyffryn the output of 3080 tons was outstanding, being over 300 tons more than the previous best figure. Production at this group of works has been raised from about 12,000 tons weekly three years ago.

Lead Price Again Reduced

A further reduction—by £4 to £84 a ton delivered—in the U.K. price of good soft pig lead was announced last week by the Ministry of Supply. This follows a reduction by £9, earlier in the month.

Winning Ambulance Team

Gaskell Marsh works ambulance team, Widnes, were successful for the fourth consecutive year in the ambulance competition for the Lady Muspratt Shield. Eleven teams, representing the general chemical division of I.C.I., Ltd., competed at Runcorn.

New University Press

The Senate of London University has decided to establish its own press, which will be known as the Athlone Press (after the name of the Chancellor). The difficulty of getting learned works published since the war has emphasised the need for an independent press.

Finland Seeks U.K. Fuel, Steel, Chemicals

A Board of Trade Press note announcing the conclusion of the Anglo-Finnish trade talks in London last week disclosed that a considerable increase in the volume of trading by both countries is to be expected. Among Finland's principal requirements from the U.K. are coal, oil, steel, machinery, textiles and chemicals.

Cotton Industry Research

An appeal for £500,000 for a building fund to extend the textile industries' Shirley Institute at Didsbury, Manchester, has been launched by the British Cotton Industry Research Association. If the association can collect £150,000 from subscribers the balance will be made up by £90,000 from its own reserves, £55,000 from the Cotton Board, and £205,000 from the Department of Scientific and Industrial Research. The size of the institute would be nearly doubled.

Synthetics Firm's Expansion

Marchon Products, Ltd., has received permission from the Board of Trade to erect at Whitehaven an additional factory building of 70,500 sq. ft. An extension of office accommodation of 8000 sq. ft. has also been licensed. The company states that the extensions, necessitated by the rapidly expanding home and export trade in synthetic detergents and allied products, should eventually give employment to 500 more workers. Work on the new buildings is expected to start during the next few months.

• OVERSEAS •

New Chinese Salt Monopoly

China's important domestic salt trade as well as exports have been taken over by a new salt monopoly company established by the Communist Government. It hopes to produce, and distribute, about 1 million tons of salt this year.

South African Fish Oil Surplus

Warehouses at the Cape are reported to be overstocked with shark and other fish liver oils. A processing works at Gansbaai has closed down and in other parts the extraction of oil has largely decreased in recent years. Prices have reached a low level.

Metal and Engineering Exhibits

All branches of Belgian industry connected with mines, metallurgy, mechanical and electrical engineering will be widely represented at the second Liége International Fair, from April 29-May 14. A large number of foreign exhibits will be included.

U.S.A. to Buy Ceylon's Oil Surplus?

The U.S.A. has offered to purchase Ceylon's entire exportable surplus of coconut oil until the end of June, 1951, according to information received from Colombo, states *Reuter*. The offer is said to have been communicated to the Government through Ceylon's Ambassador in the U.S.A., Mr. G. C. S. Corea.

$18.5 m. for "Shell" Research

Some $18.5 million will be spent by the Shell oil companies in 1950 in research to develop new chemicals from petroleum and especially agricultural products. The money will support Shell laboratories throughout the world, but the major portion will go to four principal U.S. research centres, notably that in Emeryville, California, which is operated by the Shell Development Company.

Venezuela Restricts Oil Output

The curtailment of crude oil imports by several important U.S. companies has necessitated a voluntary reduction in the output of petroleum by the major concerns operating in Venezuela. It is reported that the reductions may amount to about 20 per cent of Venezuela's exports last year, which were the highest on record. A Government spokesman has pointed out, however, that a much more severe reduction would have to take place before the country's economic position could be seriously affected.

Oil Search in Queensland

The first large-scale attempt to discover oil in Australia has recently begun in Queensland, where the Shell group has started work in what its general manager described as promising oil country. A test well is being sunk possibly to 10,000 ft. and may cost about £1 million.

Element No. 98 Created

A group of scientists in the laboratories of the University of California have created, by atomic bombardment, a new chemical element, No. 98 in the periodic table, the heaviest chemical element known. It has been named californium in honour of the university, where the six heaviest trans-uranium elements, including plutonium, were previously made.

2.5 m. Tons of Indian Salt

India will be self-sufficient in salt in 1951, it was reported in the Dominion Assembly in New Delhi. The estimated production in 1950, said the Minister of Industry, was 70 million maunds (approximately 2.5 million tons), whereas the estimated demand was 65 million maunds. In 1947 India imported 12 million maunds, 12 million maunds in 1948 and 8.9 million maunds in 1949. In 1950 the import would be 3 million maunds.

Paper Plant for Portugal

Construction of a new sulphate pulp and paper mill at Cacia, the first industrial project for Portugal under the Marshall Plan, has been approved by the ECA. The mill will be operated by Companhia Portuguese de Celulose and will have an estimated yearly production of 32,000 metric tons of sulphate pulp. Of the total cost of about $9.6 million some $4 million will be spent in the U.S.A. and over $2 million in the United Kingdom.

Efficient Oil Recovery

A new process of recovering crude oil by a solution process requiring the injection of hydrocarbon gas into reservoirs has been announced by the Atlantic Refining Company, U.S.A. Officials of the company claimed that pilot plant tests had shown that as much as 90 per cent of oil could be recovered, compared with about half that amount which is at present recoverable.

The gas is injected under conditions which promote mutual solution of crude oil and gas. As both tend to dissolve the oil swells beyond the ports enclosing it and is forced to the surface.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

A. & W. Chemical Co., Ltd., London, E.C. (M., 25/3/50). February 21, £650 deb., to J. A. Peters, Guildford, and another; charged on 1 and 2 Cricketers Court, Lower Kennington Lane, S.E., and a general charge.

E. H. Butler & Son, Ltd., Leicester, manufacturing chemists. (M., 25/3/50.) February 24, £23,000 (not ex.) mort., to Lloyds Bank, Ltd.; charged on factory premises at Thornton Lane, Leicester. *—. December 16, 1949.

Thermal Syndicate, Ltd., Wallsend. (M., 25/3/50.) February 15, series of £80,000 debs., present issue £20,000; general charge. *Nil. April 1, 1949.

Universal Solvents (Brighton), Ltd., Hove. (M., 25/3/50.) February 22, £300 deb., to E. P. A. Smith, Hove; general charge.

Satisfactions

British Celanese, Ltd., London, W. (M.S., 25/3/50). Satisfaction February 24, of first deb. stock and supplemental deed reg. October 2, 1943, and November 8, 1944, to the extent of £6,500.

Francesca (England), Ltd., London, W., manufacturing chemists. (MS., 25/3/50). Satisfaction March 1, of deb. reg. February 20, 1948.

Hornflowa, Ltd., London, E.C., manufacturers of plastic powders, etc. (M.S., 25/3/50.) Satisfaction March 1, of charge relating to 69 John Street, Maryport, reg. April 28, 1948.

Liquids Control, Ltd., London, N.W. (M.S., 25/3/50.) Satisfaction February 28, of deb. reg. April 4, 1949.

Macrome, Ltd., Wolverhampton, metallurgists. (M.S., 25/3/50.) Satisfaction February 28, of deb. reg. November 18, 1948, to the extent of £29,800.

Treforest Chemical Co., Ltd., London, E.C. (M.S., 25/3/50.) Satisfaction February 27, of charge reg. September 15, 1941.

Wellcome Foundation, Ltd., London, N.W., chemical manufacturers. (M.S., 25/3/50.) Satisfactions February 28, part of property (138-144 (even) Gower Street, 25-35 (incl.) Gower Place, 209-225 (odd) Euston Road, St. Pancras) comprised in mortgage and mortgage and charge reg. respectively May 9 and July 29, 1947, having been released from said charges.

Increases of Capital

The following increases in registered capital have been announced:—Factron Products, Ltd., from £100 to £1000, H. & T. Proctor, Ltd., from £25,000 to £40,000, Dextran, Ltd., from £100 to £5000, Turkdean, Ltd., from £50,000 to £100,000.

Company News

Canadian Chemical Result

The Dominion Tar and Chemical Co., Ltd., (of Canada) made a net profit in the year ended December 31, 1949, of $1,811,216 against $2,186,950 in 1948. There is a surplus of $4,599,793 ($3,530,578 at the end of 1948). Expenditure on capital account amounted to $3,298,463 during the year. The new salt plant at Unity, Sask., and the new chlorine and caustic soda plant at Beauharnois were brought into production during the year.

Fisons, Ltd.

The terms of the new debenture issue were announced by the board last week. £3.5 million 4¼ per cent first mortgage debenture stock (1965-83) at a price of 98 per cent, is to be offered for public subscription.

Monsanto Chemicals, Ltd.

The trading profit for the year ended December 31, 1949, was £810,021 (£876,700). A net profit of £278,499 (£363,898) remained after taxation, depreciation allowance, etc. The directors recommend a final dividend on the ordinary stock of 30 per cent, less tax, payable May 19, making a total for the year of 45 per cent, less tax. A balance of £448,600 (£423,789) is to be carried forward. The annual general meeting of the company will be held in London on May 10.

Chemical and Allied Stocks and Shares

APART from some expansion of interest in overseas shares, stock markets have remained quiet and generally inactive. The tendency to await the Budget continues. There were only small indefinite movements in British Funds and industrials. Chemical and kindred shares moved narrowly and were inclined to ease, Imperial Chemical to 41s. 10½d., although there is general confidence that the 10 per cent dividend will be maintained. In fact, owing to benefits from the larger capital, it is being expected that the results will show good expansion of earnings.

Albright & Wilson 5s. shares have changed hands around 29s., Boake Roberts were 25s. 6d., F. W. Berk 14s. 3d., Amber Chemical 2s. shares 4s. 9d., Bowman Chemical 5s. 3d., Brotherton 19s. 3d., and Pest Control 5s. shares 7s. 10½d. Elsewhere, Laporte Chemicals 5s. shares showed firmness at 9s. 6d. and Lawes Chemical 10s. shares were 10s. 6d. Monsanto Chemical 5s. shares eased to 49s. 6d. on the reduced profits, although the results created a good impression. The dividend is, of course, maintained at 45 per cent. Fisons have changed hands around 21s. 9d. following details of the new capital terms.

A feature was a sharp rally to 62s. 6d. in British Xylonite, while other shares of companies connected with plastics were mostly firmer, although De La Rue fell to 21s. British Industrial Plastics 2s. shares were 5s. 6d., Kleemann 8s. 1½d., and elsewhere, the 4s. units of the Distillers Co. were 16s. 10½d. Turner & Newall have eased to 76s. 3d. and United Molasses to 37s. 9d., although there has been revived talk in the market of share bonus possibilities in respect of the latter company.

Glaxo Laboratories at 45s. 6d. have been fairly steady, and Boots Drug 5s. shares were 45s. 6d. "ex rights" with the new shares 10s. 7½d. premium. It is generally believed there are good prospects of Boots being able to maintain dividends of 40 per cent on the larger capital.

British Oxygen have been firm at 94s. 6d., awaiting the financial results. British Aluminium were 40s. 6d., and General Refractories firm at 22s. 7½d. on the financial results. There was again uncertainty in Lever & Unilever (41s. 6d.), although there is general confidence that the 10 per cent dividend will be maintained.

In other directions, British Glues & Chemicals 4s. shares kept at 20s. Borax Consolidated were 53s. and Amalgamated Metal steady at 18s. 1½d. Metal Box at 90s. and United Glass Bottle at 68s. 9d. both remained firm features.

Iron and steels have been steadier, Stewarts & Lloyds at 50s. 3d., United Steel 24s. 6d., Hadfields 26s. and Thomas & Baldwins 12s. 9d. Staveley were 75s. 3d., and Tube Investments changed hands up to £5⅝. Associated Cement were firmer at 76s. 3d. at which there would be a yield of 5⅞ per cent on the basis of last year's 22½ per cent dividend. Rugby Cement 5s. shares at 16s. 10½d. have remained under the influence of the higher dividend.

There have been uncertain movements in oil shares which failed to benefit from news of the summer petrol "bonus." Reports have been current that the U.S. is to make a further objection to Britain's ban on oil imports from dollar countries. Shell have eased to 63s. 9d. at the time of writing and Anglo-Iranian also moved back. A sharp rise in Burmah Oil to 60s. reflected hopes of better news in regard to war damage compensation.

Overland Pipeline Proposed

DEVELOPMENT of an oil pipeline crossing Scotland from Loch Long to Grangemouth, to feed the expanded Grangemouth refinery, has been proposed. This project would involve the creation of a major tanker depot and pumping plant at the receiving end and an adjustment in organisation at the Grangemouth end, where it had been expected that oil would be imported by tanker. Grangemouth town council has asked the sponsors of the scheme to plan a different approach to the refinery on the ground that a given area of land will require to be "sterilised" on either side of the pipeline. The present approach cuts through land intended for housing.

Details of the scheme, which it is anticipated will cost about £2½ million, are expected to be announced shortly by the Anglo-Iranian Co. The pipeline will have a capacity of two million tons a year.

Ether Explosion

An outbreak of fire in the factory of Duncan Flockhart and Co., Ltd., chemical manufacturers, Edinburgh, caused by the explosion of a vessel containing ether, caused damage to the ether sealing room before being brought under control.

Prices of British Chemical Products

Fall in Values of Lead Chemicals

THERE has been a steady call for supplies of most of the industrial chemicals and particularly from the textile and plastics industries. Consumers' delivery specifications have been fully up to schedule. The export demand continues at a satisfactory level, the bulk of the shipments being to Empire destinations. Values throughout the market are steady and there are few changes of any importance to record. The reduction in the prices of white and red lead recorded last week have been followed by further reductions. The new basis prices are as follows: Dry white lead £112 15s. per ton; ground white lead £133 10s. per ton; red lead £103 per ton; Orange lead £115 per ton; red lead ground in oil £126 5s. per ton and orange lead ground in oil £138 5s. per ton. Among the coal tar products, pitch is in fair demand and a good interest continues to be maintained in the light distillates. Phenol is now exempt from Key Industry Duty.

MANCHESTER.—Values on the Manchester chemical market have generally been steady. Exceptions were the irregular trend of non-ferrous metals in which there was a decline in lead and a rise in zinc compounds. Contract deliveries to home users of the alkalis and other regular lines have been maintained and there has been a fair amount of new inquiry and actual business during the past week. Shippers' inquiries have been fairly widespread. Most fertilisers benefited from the usual seasonal improvement.

GLASGOW.—There has been a definite increase in business in the Scottish heavy chemicals market, possibly due to the fact that everyone has an eye on the increased railway rates which come into operation shortly. It is obvious that many firms are stocking up materials which come from other parts of Britain. The export market remains fairly steady.

Price Changes

Rises: Antimony oxide, formic acid, iodine, pyridine, soda ash, sodium iodide, zinc oxide.

Reductions: Lactic acid, red lead, white lead, litharge, caustic soda.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50.000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£160 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s. per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 7d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d, per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £70 per ton; dark tech., £60 per ton ex works; barrels returnable.

Lead Acetate.—Nominal.

Lead Carbonate.—Nominal.

Lead Nitrate.—Nominal.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £103, orange lead. £115. Ground in oil: red, £126 5s., orange, £138 5s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £112 5s. per ton. Ground in oil, English, under two tons, £133 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£108 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d. £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £61 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s. 2d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 16s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 10s. per ton, d/d, in drums; broken, £25 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £86 10s.; green seal, £85 10s.; red seal, £84.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £10 8s.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £16 6s., rising by 2s. 6d. per ton per month to June, 1950. National No. 2, £10 18s. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. Manchester: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. Manchester: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d per gal.; 99%, 3s. 1d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. Manchester: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. Manchester: £5 10s. f.o.r.

Pyridine.—90/160°, 21s. 6d. Manchester: 19s. to 22s. per gal.

Toluol.—Pure, 3s. 2d. per gal.; 90's, 2s. 4d. per gal. Manchester: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol 98/100%.**—Nominal.

o-**Cresol 30/31° C.**—Nominal.

p-**Cresol 34/35° C.**—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

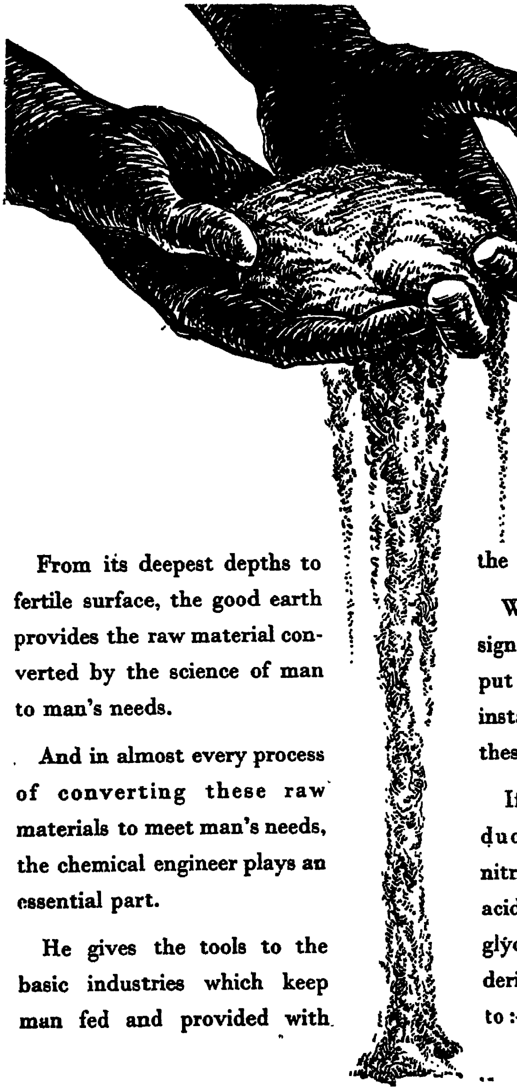
o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

London: March 28. The prices of all refined oils and fats will remain unchanged during the eight-week period ending on April 22. The price of linseed oil is from £82 to £132 per ton, according to quality; castor oil from £108 to £115; whale oil from £75 to £90. The prices of all other unrefined oils and fats will remain unchanged.



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Next Week's Events

MONDAY, MARCH 27

Incorporated Plant Engineers

Leeds: University, 7.30 p.m. Film by Vacuum Oil Co.: "Modern Methods of Lubrication."

Institution of the Rubber Industry

Manchester: Engineers' Club, 6.15 p.m. H. Whincut: "Polytetrafluoroethylene."

Society of Chemical Industry

Leeds: University, 5 p.m. The Brotherton lecture. Dr. H. H. Hodgson: "The Pilgrimage of a Colour Chemist."

TUESDAY, MARCH 28

The Royal Institute of Chemistry

Welwyn Garden City: The Cherry Tree, 8 p.m. Dr. E. C. Wood: "Analytical Results—Some Facts and Fallacies."

Hull Chemical and Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. (with OCCA). L. Griffiths: "Perspex."

The Institute of Fuel

London: Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. M. W. Thring (Head of the physics department, BISRA): "High-Temperature Combustion-Heated Furnaces."

WEDNESDAY, MARCH 29

The Chemical Society

Edinburgh: Chemistry Department, King's Buildings, 11 a.m. Sir Ian Heilbron: "The Chemical Society—A Mid-Century Review." Followed by annual general meeting at 12 noon.

North British Station Hotel, 7.30 p.m. Anniversary dinner, at which the new president, Prof. E. K. Rideal, will be installed.

German Industries Fair

Hanover: Messegelände. Light industries section (until April 2). Details from: EPPAC, Ltd., 2-5 Studio Place, Knightsbridge, S.W.1.

The Institute of Physics

London: University College. Annual conference of stress analysis group. (March 29-31.)

British Association of Chemists

Liverpool: University, (Nicholson Chemistry Lecture Theatre) 7 p.m. Demonstration of scientific instruments.

THURSDAY, MARCH 30

The Chemical Society

Edinburgh: Zoology Department, King's Buildings, 11.30 a.m. Prof. G. Hevesey: "The Application of Radioactive Indicators in Biochemical Studies." (Faraday Lecture).

The Royal Institute of Chemistry

London: Philips Electrical, Ltd., New Road, Mitcham Junction, 7.15 p.m. Dr. W. D. Jones: "The Production of Heat Resisting Materials by Powder Metallurgy."

Leeds Metallurgical Society

Leeds: University, 7 p.m. A member of the research staff of the British Cast-Iron Research Association will present a paper on "Nodular Cast Iron."

FRIDAY, MARCH 31

The Royal Institute of Chemistry

Glasgow: Merchants House, 30 George Square, 10.30 a.m. Annual general meeting. 11.30 a.m.—Presidential address by Prof. J. W. Cook.

University, 2.30 p.m. G. G. Henderson memorial lecture. Dr. W. M. Cumming: "The Growth of Applied Chemistry in Glasgow."

Sheffield: Department of Applied Science, St. George's Square, 6.30 p.m. (with Royal Statistical Society). Discussion: "Variability in Chemical Analysis."

SATURDAY, APRIL 1

The Royal Institute of Chemistry

Glasgow: Works visits during the day. 7 p.m. Central Hotel. Annual dinner. Principal guest: Lord Boyd Orr, Chancellor of Glasgow University.

The British Interplanetary Society

London: Caxton Hall, Westminster, S.W.1, 6 p.m. A. C. Clarke: "Space Travel, Fact and Fiction."

The BAC Dinner

MANY people of distinction in chemistry and chemical and allied industries notified their intention of attending the dinner of the British Association of Chemists, held on Friday this week at Charing Cross Hotel, London. This year's president is Dr. Herbert Levinstein, who was one of the association's earliest presidents, many years ago. Those who accepted invitations included Professor J. W. Cook (Royal Institute of Chemistry), Dr. T. P. Hughes (Chief Chemist, Farnborough Research Station), Mr. F. A. Greene (Institution of Chemical Engineers), Sir Ian Heilbron (President of the Chemical Society) and Dr. L. A. Jordan (Director, Paint Research Station). Sir John Russell, in a goodwill message, declared that the association should be regarded as the modern equivalent of a Guild of Chemists.

The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Petroleum Detergents

WHENEVER reference is made to the enterprises which are widening the field of chemical processes in this country the growing effectiveness of the relatively young industries based on petroleum derivatives is usually the factor which comes most readily to mind. They represent, in fact, very much less than half the tale of new chemical products in the U.K. which had no real counterpart in the years before the war; but, because of the essential character of the materials they are producing and of the very much larger range they promise to yield, the subsidiary enterprises linked with the new programme of petroleum refining are recognised to be potent factors in the future of industries.

One of the outstanding characteristics of the growing ability to procure essential materials and some new ones by the petroleum route is the change which is being wrought in traditional activities. The "synthetic" detergents based on petroleum derivatives are at the moment perhaps the most obvious example. Their adoption in the domestic sphere has been more rapid than could have been foreseen and the extent of their acceptance has fairly certainly not yet reached the limit. In industries, however, these new surface active agents were tested, and in many quarters accepted, before they were presented to the domestic market. In the degreasing of metals, in wool washing, dyeing and other textile processes the new materials are affording possibilities of effective detergency under difficult conditions which made it quite certain that they have come to stay.

For practical purposes, the petroleum detergents can be classed as the alkyl sulphates and the alkyl aryl sulphonates, although these by no means exhaust the possibilities of producing materials which dispense with the need for soap in a fairly wide field of uses. Emphasis seems to rest at the present upon the alkyl sulphate form, although development here and in America, the home of petroleum industries, has shown that the alkyl aryl sulphonates can be no less effective. They represent the largest proportion produced in the U.S.A. From the user's point of view, the differences between the two are not significant. Both have the marked advantages of not forming a precipitate in the presence of the salts occurring in greater or less degree in untreated water and show an equal indifference to acid solutions and some of the metals which precipitate fat soaps.

On Other Pages

Leader:

Petroleum Detergents . . 455

Notes and Comments:

Bulk Buying Doctrine . . 457
No Conspiracy . . 457
Chemical Textiles . . 457
Finance and Fertilisers . . 458
Co-operation in Safety Measures . . 458
Glassware from Germany . . 459
Suppliers Reply . . 459
Iodisation of Edible Salt . . 460
" A United Chemical Profession " . . 461
Expansion of Dutch Industries . . 462
Widened Alkali Act . . 463
Another U.K. Refinery . . 463
More Price Rises . . 463
Synthetic Detergents . . 464
Insecticides and the Poisons Act . . 464
Production and Packaging . . 465
Modern Soil Chemistry . . 466
Stability of Powders . . 467
Production of Technical Argon . . 468
U.S. Studies of Air Pollution . . 469
Dust and Fume Control . . 471

METALLURGICAL SECTION

U.S. Titanium Progress . . 473
Zirconium and its Compounds . . 474
New Steel Capacity . . 475
Practical Research . . 475
Nickel-Clad Steel . . 476
Aluminium Sheathing of Cables . . 476
Canadian Nickel Results . . 477
Steel Technology . . 477
Toxic Agricultural Chemicals . . 480
S. African Chemical Enterprise . . 482
India's Attenuated Soap Industry . . 483
German Patent Laws . . 486
Forecast for 1950 . . 489

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These are among the very significant facts which some time ago were assembled in much fuller form by A. Lawrence Waddams (chemist of Shell Chemicals, Ltd.), largely in response to objections which had been raised to the spreading use of synthetic detergents. That complaint is not a novelty, and last week there was raised again substantially the same case as was first advanced soon after synthetic detergents came into fairly general use in the centres of woollen and textile industry. The sewage authority of Bradford is claiming that some sewage disposal filters are becoming ineffective and the recovery of wool grease, which contributes a substantial return to the Bradford civic budget, is becoming increasingly difficult. These things, in their view, require that much more restraint must be exercised in the use of synthetic detergents, which they identify, without very much conclusive evidence, as the primary cause of whatever aberrations are found in the specialised costly plant which Bradford installed, with special capacity for fat recovery.

This further piece of " evidence " in the case which is being built up in various parts of the country for closer statutory regulation of industrial effluents is peculiar to Bradford and the one or two other centres where textiles are the basic industry, and the critics admit that their objections have more to do with what might happen in the future, if the use of synthetic detergents continues to spread at the present rate, than with with the present. It is not difficult to show on the evidence of laboratory tests that large-scale injections of an alkyl sulphate in a sewage sample will render inoperative the acid cracking process employed in the grease-recovering centres. What has not been established, and most probably never will be, is that such a concentration of chemical detergent will be reached at some future stage in the sewers, even of Bradford or Huddersfield, where their obvious advantages in wool processes have gained for these detergents wider acceptance than anywhere else.

One aspect in which a chemical addition to sewage, even in trace amounts, may have disrupting effects on disposal plant is the capacity to destroy anaerobic bacteria. Investigations so far have shown the alkyl sulphates are more or less innocuous to the principal

(*continued on page* 458)

Notes and Comments

Bulk Buying Doctrine

SOME of the reasons for the heat engendered by the repercussions in the House of Commons of the Minister of Health's dispute with British suppliers of laboratory ware are becoming clear. The association, whose members, it now appears, would have supplied for the same or a smaller sum the beakers and flasks required for the hospitals, which Mr. A. Bevan procured, with undisguised satisfaction, from German suppliers, has wisely put on record the facts in its possession about this unnecessary *fracas*. It seems clear that the suppliers were not responsible for it (*page 459 in this issue*). The British Chemical Ware Manufacturers' Association says this: "Readers of Mr. Bevan's statement and answers would no doubt get the impression that a group of manufacturers were conspiring together to rob the public. What was really happening was that the Ministry of Health was striving to break down a carefully built up system of economical distribution of laboratory glassware and other similar goods—in order to bolster up the Ministry's own case for bulk buying."

No Conspiracy

THE association emphatically refutes the suggestion that there is anything in the nature of a monopoly or price ring. Their common interests are to resist foreign competition and "black-market operations." The Ministry of Health evidently is unprepared to admit that distribution of such things as laboratory glassware is an essential and specialised job. The Ministry has in fact set up six stores to serve as distribution centres of hospital equipment and is stated to have claimed for them discounts which the laboratory furnishers earn by their expertness in a highly complicated service. The wisdom of attempting to dispense with the experts is doubtful. The unwisdom of Mr. Bevan's disingenuous evasion of the fact that retail laboratory furnishers were never asked to quote for the order—on which he saved "10 to 30 per cent" in Germany—is not doubtful at all.

Chemical Textiles

IMPRESSIVE evidence of the vigour and resilience of one of the characteristically modern groupings of chemical industry, that linked with synthetic filaments and their textile products, has been presented with much candour—enlivened with illustrations and decorative embellishments which would seem very strange in a British company report—by the Celanese Corporation of America. Its unconventionality by British standards does not lessen the capacity of the American report of 1949 to inspire confidence, even though it has to record the sharp adverse wave which swept over American textile industry in the early part of last year. There was here no parallel with the curtailment of textile buying, which in America reached its peak just 12 months ago and was the chief factor in reducing Celanese Corporation's profits to $20.6 million. Such earnings still sound prodigious, except in comparison with 1948's $38.8 million. Elsewhere, that east wind over American textile industry must have produced very much more disconcerting results. Chemical yarns, as this report makes clear, suffer scarcely any of the violent price fluctuations characteristic of the wool and cotton markets and are immensely more responsive to changing demand. The need for such adaptation may be gauged by the scale of the reduction of the American corporation's sales in the year by $59 million to $171 million. Expenditure on new plant was cut to about one-fifth of the $41 million employed in 1948, but the momentum of the original programme will continue to enlarge American production of cellulose acetate yarns, fibres and plastics, and the family of essential associated chemicals.

(continued overleaf)

Finance and Fertilisers

THE Government decision to continue a fairly substantial measure of assistance to encourage use of artificial fertilisers has averted what might have been a serious setback, to an important branch of chemical industry as well as to the agricultural community. While the grants from July 1 of one-third of the cost of fertilisers used on marginal grassland and two-thirds in respect of old grassland put under plough will not entirely recompense the first overall cut in fertiliser subsidies, fertiliser manufacturers believe that this and the improvements in some farm produce prices announced last week will prevent serious cuts in fertiliser usage. The situation, although far from ideal, might have been a great deal worse. The situation foreshadowed by the early proposal, to remove all fertiliser subsidies by July 1951, adding approximately 50 per cent to farmers' payments, would have operated very adversely upon the growth of two key industries, food production and the manufacture of fertilisers. That possibility fortunately does not appear to have deterred the principal makers of fertilisers from planning to increase capacity on a handsome scale. Fison's confidence in widened demand was attested by the news several weeks ago of the intention to spend more than £5 million to enlarge production of sulphuric acid, superphosphate and compound fertilisers and initiate the production of triple superphosphate. The cordial acceptance of the £3.5 million offer of shares, which had the good fortune to coincide with the news from the Agriculture Ministry, commends that enterprise.

Co-operation in Safety Measures

A PRAISEWORTHY impartiality in a good cause appears to have animated the publication in the chemical trades union journal of an uncompromising presentation by a safety officer of the shortcomings of most trades unionists in reducing the element of risk in chemical works processes. The principle which underlies the proposals made in this article (*The Chemical Worker*, *31*, No. 3, 12) is the somewhat rare one of doing something for the good of the industry instead of or the interests of a section. Safety is everybody's business and certainly transcends wage packets and paid holidays or dividend warrants in ultimate importance. The writer says that, in his experience as an industrial safety officer, he has found unions more interested in securing damages for their members who have become accident cases than in doing what might have helped to prevent the accidents. He asks why the trades unionists do not also take some of the blame for allowing accidents to happen "because of their 'do-nothing' attitude." Seldom, he alleges, do representatives of the trade unions attend any of the safety meetings. W. J. S. suggests a number of ways in which the trades unions might help make the accident rate even smaller. He pertinently asks how often is "safety" discussed at branch meetings, and how much space is given to "safety" in the union's publications.

PETROLEUM DETERGENTS

(*continued from page* 456

digesting bacteria, even in substantially larger concentrations than have been recorded in sewage.

Over the rest of the U.K. the chemical substitutes which are helping to ease the shortfall in domestic soap supplies (estimated to represent approximately the difference between 450,000 and 300,000 tons a year) are going into household use, widely but in small quantities, and to the laundries. For many purposes, no synthetic yet produced shows any promise of being a complete substitute for normal soap, but in their present popular uses no diminution is in the least likely, even should there be a substantial easing of the world need to reserve many fats for food rather than for soap. Against that remote prospect is contrasted the certainty that within a few years the U.K. will have the largest assembly of petroleum and related industries in Western Europe.

GLASSWARE FROM GERMANY

"Saving of 10-30 Per Cent"

QUESTIONS regarding the purchase of glassware from Germany for supply to hospitals were again asked in the House of Commons last week. Further information on the terms of the German contract and conditions prevailing here was sought by Mr. John Grimston, Sir H. Williams and Mr. E. H. Keeling.

Mr. Aneurin Bevan replied that he understood that an agreement between manufacturers and distributors of furnace-blown and pressed laboratory glass precluded manufacturers from tendering for Government bulk requirements of beakers, flasks and heavy chemical glassware. Total hospital needs were estimated at £15,000 a year, of which one-third could be obtained under direct contract with manufacturers. The landed duty-paid value of glassware recently imported from Germany was £2765, the rate of duty being 33 per cent. The purchase represented a saving varying between 10 and 30 per cent compared with prices for the same size and types of British glassware.

Dollar Aid Alleged

In answer to a further question from Mr. R. V. Grimston who stated that there was "a dollar component" in the German goods, the Minister of Health disagreed and said that the reason for going to Germany was that in the U.K. retailers alone were allowed to tender. That was why the saving had been made. British manufacturers had, however, been asked to tender again, and he hoped "their future conduct would be better."

Mr. E. H. Keeling asked the Minister if he was aware that his statement that retailers had been asked to tender was wrong? They were not asked. The questioner recalled that, by buying from Germany, the Ministry had gone against the advice of a Government committee, which had said that laboratory glassware was a key industry which should be maintained in this country at all hazards.

Mr. Bevan said that if the industry was so necessary for the welfare of Britain, that situation ought not to be exploited by the industry itself. Replying to a further question from Mr. Emrys Roberts, whether the arrangement between the glass manufacturers and retailers should be referred to the Monopolies and Restrictive Practices Commission, the Minister of Health said he had the matter under consideration. (*Comment: page* 457)

SUPPLIERS REPLY

"No Glassware Tender Invited"

THE Minister of Health's omission to answer in the House of Commons the question whether retailers were in fact invited to tender for the glassware required by the Ministry for hospitals is one of the matters on which revealing comment has been made by the British Chemical Ware Manufacturers' Association. "The fact is that no retailer was asked to tender," observed the association in a statement this week to THE CHEMICAL AGE. "If they had been invited it is probable that they would have quoted prices very near the imported duty-paid value mentioned in the House.

"The present dispute is a year old. In February 1949 the Ministry of Health issued a tender for a variety of laboratory glassware. The manufacturers asked the Ministry to obtain tenders from their authorised distributors. The Ministry refused to do so.

German Imports Threat

"A meeting was called at which distributors were invited to state their case. At this meeting Ministry of Health and Ministry of Supply officials were present, but the Ministry of Health deliberately prevented the manufacturers from being invited to attend. In July the Ministry issued a further tender for beakers and flasks only and they called a meeting of the manufacturers only and tried to persuade them to disown the laboratory furnishers. They threatened to import from Germany unless the manufacturers agreed to their proposals and they said they could accept no compromise whatsoever. The manufacturers submitted a complete statement of their case on August 22, 1949 and sent a letter promising adequate supplies of glassware and quantity discounts if the Ministry would invite their distributors to tender. They promised priority to compensate for the delay caused by the dispute.

"On January 31, 1950 the Ministry of Supply, who are responsible for sponsoring the scientific industries in this country, called a meeting of manufacturers, distributors and officials of the Ministry of Health. At this meeting all parties agreed to a compromise whereby the Ministry of Health would invite the laboratory furnishers to tender and the manufacturers and furnishers agreed to do everything possible to facilitate supplies of beakers and flasks at prices in keeping with the quantities required." (This invitation, as stated, did not materialise.)

Iodisation of Edible Salt

Ministry Backs Medical Recommendations

THE addition of iodine to salt as a prevention of goitre has been recommended in the report of the Medical Research Council. The council, noting the increasing incidence of the disease, urged that preventive action should be taken on a national scale by the addition of a trace of iodine to salt used for domestic purposes.

The procedure recommended is the addition of either one part of potassium iodide to 100,000 parts of all salt (NaCl), or one part to 40,000 parts of packeted table salt.

This recommendation has been supported by the Ministry of Health Standing Committee on Medical and Nutritional Problems, and the Food Standard Committee has been asked to advise what measures would require to be taken. Data are required on the form in which the standard of composition should be expressed, the practicability of enforcement by chemical analysis, and whether special labelling provisions should apply to iodised salt.

Technical Problems

In 1948, production of salt for use in the home (85 per cent of total production for food purposes) consisted of prepacked free-running salt 65,000 tons; packeted household cooking salt 30,000 tons; and cut lump salt 24,700 tons.

Prepacked salt includes stoved vacuum salt, ground open-pan salt and bar salt (repacked in small pieces as "cut lump"). The addition of iodide to stoved vacuum salt and ground open-pan salt presents no difficulty, but it is technically impossible to iodise bar salt. Prohibition of the scale of all prepacked salt, unless iodised, would, therefore, bring to an end the retail sale of "cut-lump" salt.

At the present time only 1.6 per cent of the current output of prepacked salt is iodised. Since the requisite machinery exists, it is officially estimated that within a year from the issue of an order, manufacturers could iodise prepacked salt sold as "free-running" table salt, and packeted household cooking salt within two years.

The amount of potassium or sodium iodide to be added would be not less than 15 and not more than 30 parts of iodine per 1 million parts of salt. To minimise loss of iodine, iodised salt would have to be packed in moisture-resistant containers. Iodised salt would require to be labelled as such and date stamped.

Three main methods of incorporating the iodide described to the Ministry committee were these:—

(i) Spraying the salt with a solution of iodide in a mixer, followed by drying.

(ii) Spraying the salt on a moving belt system, followed by drying.

(iii) Dry-mixing. The iodide mixed with about 100 times its weight of salt is then added to the bulk of the salt.

It was suggested by the trade representatives that the prescription of a standard method of incorporation of the iodide might be considered.

The committee was satisfied that chemical analysis could be relied upon for the enforcement of the standard required.

The report has thus given support to the second alternative of the recommendations of the Medical Research Council—namely, the iodising of salt for table use, instead of iodising all salt.

Consideration was given to a criticism that the universal use of iodised salt might be deleterious to some persons is taken habitually over a long period, and it was concluded that the risk was negligible.

Few Casualties in Chemical Works

NUMBERS of deaths from industrial accidents in the United Kingdom in December 1949 were 134, against 168 in the same month of the previous year. The current year also started with an improvement, the total for January being 108 compared with 119 in January 1949. Fatalities in chemicals, oils and soaps were especially low, one death having occurred in December and five in January.

During the same two months there was only one death reported under the Factories Act, 1927, or under the Lead Paint (Protection Against Poisoning) Act, 1926. This was in December and was due to lead poisoning.

Cases of industrial diseases reported in December totalled 42 and in January 45. The latter were comprised as follows:—

January: Lead poisoning, four; other poisoning, five (mercurial poisoning, one; compressed air illness, four); anthrax, four; epitheliomatous ulceration, eight (pitch, six; tar, one; oil, one); chrome ulceration, 24 (manufacture of bichromates, one; chromium plating, 21; other industries, two).

"A UNITED CHEMICAL PROFESSION"

Aim of the British Association of Chemists

Dr. Herbert Levinstein

THE general theme of the speeches after the annual dinner of the British Association of Chemists, in London on March 24, was the desirability of a united chemical profession.

Proposing the toast of "The Ladies and Our Guests," Dr. Herbert Levinstein said they had with them a sort of "royal flush" of presidents, of the Royal Society, the Chemical Society, the Royal Institute of Chemistry, the Society of Chemical Industry, and the Institution of Chemical Engineers. Their presence testified to the good fortune of the BAC, a trade union, in having the support of the leaders of the professional societies.

Since its inception, some 30 years ago, the association had consistently served one objective, the welfare of the chemical profession. He believed they had rather more than 2500 members to-day. He would not be satisfied until they had 7500.

A Trade Union

His predecessor in the association's presidential chair, after the 1914-18 war, performed the difficult task of making the BAC a trade union, a non-political one. A union of people engaged in a technical work, they were not affiliated to the TUC and were proud of their standing. About 20 per cent of their members were directors of large and small companies in the chemical industry, and all were qualified chemists.

One of the important activities of the BAC was looking after the salary of its members, especially of their young chemists, and securing for them proper remuneration for patents. The BAC made no distinction, however, between those who were employed and those who gave employment. They were in that respect the equivalent of the old guilds. He considered they had great opportunity of uniting all those who were engaged with them, technically or scientifically, as a sort of guild of chemists, whether by affiliation with the Royal Institute of Chemists and other bodies or other means.

Sir Robert Robinson, responding to the toast, acknowledged the good work Dr. Levinstein had done for chemistry and for chemists. Recalling that most of those present were guests and therefore not members of the BAC, he declared that responsibility for that situation rested with the association. He had received from the BAC one introductory letter and nothing else. "Why do you leave out people like us?" asked Sir Robert Robinson. "I think your propaganda is bad." He personally was a member of a lot of other associations of chemists, but not of the *British* Association of Chemists.

More Vigour

As regarded the BAC having no political influence or connections, he thought it should be a body with considerable political influence. "I think, for example," he said, "that it is time we started to look for our own 'radio chemist'."

Sir Ian Heilbron, also responding to the toast, said he could claim a very long association with the BAC. Twenty-five years ago he had preached the necessity of a union of chemists, to be a counterpart in chemistry of the BMA. "If we are to have unity in the world," he added, "then for Heaven's sake let the scientists give a lead and let us have a real union of chemists." He gave an assurance he would do everything he could to further the interests of the association and he supported Dr. Levinstein's view that such a trade union could be like one of the old guilds, admitting to membership all qualified members of any particular trade or profession.

He wished every prosperity to the steps which the BAC was now taking to increase its membership, by working along parallel lines with such bodies as the

(continued at foot of next page)

Expansion of Dutch Chemical Industries

Additional Finance Sought for Superphosphates

A REVIEW of chemical industry in Holland estimates that $575 million will be needed to finance planned investments for the expansion and modernisation of the industry until 1953. The authority for that estimate is the Dutch Rehabilitation Bank.

Some chemical manufacturing companies, this report observes, are now able to produce considerably more than the home market can consume. The general chemicals production index (1938 = 100) was 98 in the first quarter of 1948 and 110 in the same period of 1949. In the last quarter of 1949 it increased to 118.

No reference is made in the report to certain large factories which are being rebuilt or otherwise modernised, nor to the highly important petroleum industry. The latter would have no need of external aid.

Mention is made, however, of the chemical expansion at the State Mines, the rehabilitation of the nitrogen undertaking of Sluiskil, the completion of the Mekog installations of Ijmuiden and the important Caltex petroleum refinery at Rotterdam.

The Albatros Superphosphate Factories which operates the superphosphate plants of the Amsterdamsche Superfosfaatfabrie and of the Vereenigde Chemische Fabrieken is said to be producing some 400,000 tons annually compared with an average of 300,000 tons just before the war. 170,000 tons of sulphuric acid—an increase of 10 per cent—is supplied by the company's own plant.

As the demand for superphosphate far exceeds the aggregate production of the four Dutch producers, the Albatros intends to put up another factory, and has appealed to the Amsterdam Stock Exchange for capital.

The N.V. Brocachemie (an affiliate of Brocades Stheeman & Pharmacia) is reported to be increasing the production of para-amino-salicylic acid at Zaandam. The Dutch need of PAS is placed at some 8000 kg. a year.

Although a number of smaller firms are stated to be making good progress, the expectation is that most expansion will in future be in the hands of the major undertakings.

An eventual surplus of nitrogen is expected as a result of recent expansion, which will necessitate an export outlet, but the bank emphasises the fact that the industry's low production costs should greatly contribute in procuring much-needed foreign currencies.

Rapid progress since the war is recorded as being made by the pigment industry, helped by the chemical developments of State Mines. Sales potential is considered high in home and overseas markets.

Mij. tot Exploitatie van Kooksovengassen has erected a generator for the production of water gas, soon to be used for the synthesis of ammonia. The company is expected to implement its plans this month.

The Royal Dutch Salt Industry, Ltd., records another increase in salt production and salt-derived chemicals during the past year. Salt output in 1949 was 330,000 tons, compared with 249,260 tons in 1948. The transfer of the plant and all activity at Boekelo to Hengelo has been completed.

"A UNITED CHEMICAL PROFESSION"

(*continued from previous page*)

Royal Institute of Chemistry—not in antagonism and each preserving its own ideals.

Professor J. W. Cook, in a brief response, said that in the Royal Institute of Chemistry they had, in many respects, aims and objects in common with the BAC. He supported the view that the time had come for a united chemical profession.

The association's president, Dr. Herbert Levinstein, occupied the chair and was supported by a number of other eminent chemists, including Professor Sir Robert Robinson (president of the Royal Society), Professor J. W. Cook (president of the Royal Institute of Chemistry), Professor Sir Ian Heilbron (president of the Chemical Society), Professor D. M. Newitt (president of the Institution of Chemical Engineers), Mr. Stanley Robson (president of the Society of Chemical Industry), Dr. L. A. Jordan (director of the Paint Research Station), Dr. T. P. Hughes (chief chemist of the Farnborough Aircraft Research Establishment), Dr. H. J. T. Ellingham (secretary of the Royal Institute of Chemistry), Mr. H. L. Howard (chairman, London section of the BAC).

ANOTHER U.K. REFINERY

British-American Collaboration

THE intention to construct at Coryton, in the Thames Estuary, a new oil refinery primarily for the production of lubricating oils from Middle East crude is disclosed in an announcement by the boards of Powell Duffryn, Ltd., and of Socony-Vacuum Oil Company, Inc., New York.

This states that "heads of agreement have been signed" to incorporate the oil storage, blending and packing business carried on at Coryton by Cory Brothers & Co., Ltd., a Powell Duffryn subsidiary, into the business carried on in the United Kingdom by Vacuum Oil Co., Ltd. (a subsidiary of Socony-Vacuum Oil Co., Inc.).

The whole of the Cory property at Coryton is to be acquired by Vacuum and the purchase price will be satisfied by the issue of ordinary shares in Vacuum to Cory Brothers. Further ordinary shares will be subscribed by Powell Duffryn and Socony-Vacuum, the Powell Duffryn share of which will amount to about £3.5 million.

Equal Control

The board of Vacuum Oil Co., Ltd., will be enlarged to give Powell Duffryn and Socony-Vacuum equal representation. When the existing Coryton business of Cory Brothers & Co., Ltd., has been incorporated into Vacuum Oil Co., Ltd., and the additional shares in Vacuum Oil Company have been issued, the equity share capital of Vacuum Oil Co., Ltd., will be held equally by the Powell Duffryn group and Socony-Vacuum Oil Company.

Approval of Coryton as the location of the new refinery is stated to have been received from the Board of Trade. The Vacuum Oil Company states that it is hoped to start construction this year and finish in 2½ years.

The capital expenditure by Vacuum Oil Company at Coryton and elsewhere will be about £10 million. This will be provided in part by the share subscriptions of Powell Duffryn and Socony-Vacuum. Discussions are in progress with the Finance Corporation for Industry, Ltd., for the provision of the balance by loan. It is not proposed at present to make a public issue.

A report in *The Times*, March 25, states that a Vacuum Oil Company official has affirmed that the maximum of equipment will be manufactured in this country. Some will necessarily come from the United States.

The refinery should have a total throughput of about 750,000 tons a year.

WIDENED ALKALI ACT

Carbon Black Not Affected

FOLLOWING the public inquiry in October last year (THE CHEMICAL AGE, *61*, 587), and after consultation with the local authorities and other interests concerned, a new order has been made entitled the Alkali, etc., Works Order, 1950. This came into operation on March 25, and amends the 1906 Act by making a number of extensions to the manufacturing processes controlled.

The effect of the order is to add volatile organic sulphur compounds and fluorine to the list of noxious or offensive gases, the discharge of which into the atmosphere is controlled; to add fluorine works and acid sludge works to the list of scheduled works liable for registration under the Act; and to extend the range of processes carried out in sulphuric acid works, bisulphite works and cement production works, the operation of which renders the works liable for registration under the Act.

The original draft order, which was published in October last, also proposed to regulate fumes containing carbonaceous particles from black production works, and to impose registration on carbon black works, but it has been decided not to include carbon black in the present order.

More Price Rises

INCREASES in the controlled price of sulphuric acid taking effect to-day (April 1) have been announced by the Board of Trade. The maximum price of "weak sulphuric acid" (BOV, approximately 77 per cent) is raised by 11s. 6d. per ton and of "strong sulphuric acid" (94-96 per cent) approximately by 14s. 6d. per ton. These increases appear to represent the changes which have been anticipated since the devaluation of the £ sterling rendered much more costly supplies of sulphur from the U.S.A. One representative maximum price of a concentrated grade of sulphuric acid will now be approximately £7 17s. per ton delivered.

Zinc and Oxide

The domestic price of zinc was raised on March 28 by £2 to £89 10s. a ton, the second increase in two weeks. Zinc oxide prices were increased by £1 15s. per ton for 2-ton lots, delivered, the new levels being £85 15s. (red seal), £87 5s. (green seal), and £88 5s. (white seal).

SYNTHETIC DETERGENTS

Their Effect on Sewage Plants

THE problem which has been facing the Bradford sewage undertaking at Esholt for some time, of the effect of the increasing use of soap-saving liquids and powders on the efficiency of the works, was referred to by Mr. Stanley Scott, chairman of the Sewage Committee, at a recent meeting of the City Council. He gave a warning that the increasing use of synthetic detergents might prove a menace to the city's health and finances. It might mean the clogging of filters, while the extraction of wool grease would become impossible, which would have a drastic effect on the rates.

Future Risks

Mr. Scott pointed out that there was no single process for " cracking out " these synthetic detergents from sewage that would be applicable to all the three types if used simultaneously. He had himself seen two six-foot deep filters " black septic " in less than six months after being dosed with synthetic detergent in solution. It was not generally realised what would be the position of the city if such a thing happened to the filters at Esholt.

Mr. W. H. Hillier, sewage works engineer and manager, subsequently emphasised the warning that the extensive use of synthetic detergents would have a more serious effect on Bradford's system of sewage disposal than on most other sewage undertakings in the country. The Bradford works were built round the use of sulphuric acid and the trouble was caused by the fact that these synthetic detergents were not affected by the acid.

Possible Charges

Other works, such as those at Huddersfield and Halifax, using acid in a different way, were affected to a less degree.

If the " acid cracking " system had to be changed it would involve a huge expenditure, for the process considerably reduced the sewage bulk, and other systems would also mean considerable extensions to the works. Also equally important would be the serious reduction in revenue from the sale of greasy products.

Mr. Hillier stated that the efficiency of two of the main processes was impaired, but they were not yet in serious trouble. They were concerned about the future. He believed, however, that when soap became more freely available the use of synthetic detergents would diminish.

(*Comment: page* 455)

SYMPOSIUM FOR STUDENTS

Lectures by Prominent Chemists

SOME 700 secondary and grammar school pupils, boys and girls, formed the audience to which eight prominent scientists gave ten-minute lectures at a symposium at Leeds University on March 24. Promoted by the Leeds area section of the Royal Institute of Chemistry, it was the first conference of its kind to be held in Yorkshire. The students, who came from all parts of the country, were specially chosen by their head teachers because of their interest in chemistry or related subjects.

Professor F. Challenger, vice-president of the RIC, who opened the symposium, said that the whole intention was to assist those who were thinking of making a career in some branch of chemistry.

He referred to the student of science as one whose enthusiasm sometimes led to a lack of balance, and to a forgetfulness of the relation of knowledge and experience to things outside the boundaries of science. He maintained that a wholehearted devotion to the study of science should not be incompatible with the capacity to write and speak good English. No one, said the professor, who had had experience of reading scientific manuscripts would deny that this warning was needed.

Varied Aspects

In addition to Prof. Challenger, the lecturers and their subjects included Mr. J. W. Baker, reader in organic chemistry at Leeds University (" Training in the University "); Mr. R. L. Elliott, head of the department of chemistry and dyeing at Bradford Technical College (" Technical College Training "); Mr. G. Brearley, managing director of Brotherton & Co., Ltd., Leeds (" Industrial Research "); Mr. J. R. Nicholls, deputy Government chemist; Prof. R. E. Tunbridge, professor of medicine, Leeds University ("Chemistry and Medicine "); Miss Mamie Oliver, research chemist; and Mr. W. A. Wightman, secretary of the Leeds area section of the Royal Institute of Chemistry.

Insecticides and Poisons Act

IN a written answer to Brigadier Medlicott, asking whether insecticides now being used in relation to agricultural and horticultural produce complied with requirements of the Poisons Act, the Home Secretary, Mr. Chuter Ede, stated that he had no evidence that this was not the case.

Production and Packaging Efficiency

Early Co-ordination to Prevent Corrosion Losses

THE paramount importance of using every safeguard against the corrosion of metal parts, during assembly or other stage of production, was emphasised to the Midland branch of the Institute of Packaging by Mr. J. E. Evan Cook, a specialist in export packaging.*

It had been calculated (he said) that rust costs the world about £500 million a year. Although everyone was aware of the damage potential of rust, few took the necessary precautions in advance. That absence of forethought was always accompanied by damage.

From the standpoint of the factory management, delay in applying preservative treatment could eventually necessitate throwing the rusted product away as useless, or de-rusting, or other costly renovating process, or "jobbing off" the goods at reduced prices.

The simplest means of countering corrosion was to apply preservative protection. Paint, ideal for certain purposes, was not the universal protective; sometimes the paint needed a preservative coating.

Unpainted surfaces required, of course, rust inhibitors—usually oils or greases containing anti-corrosion compounds. These must, however, be rust-inhibitors. Some oils and greases actually caused corrosion.

Rust often appeared even after very careful preservation treatment. It usually was due to failure to clean before painting. As cleaning and degreasing cost money, and added to the total cost of production and packing, it was desirable to avoid the need for it. Use of rust-inhibitor oils and compounds instead of the traditional cutting oils and coolants was recommended.

Fingerprints were one of the worst enemies of precision instruments. No component part, sub-assembly or assembled product should go into store until it had been given some form of preservative treatment. This was essential for working parts, or other important precision parts. Preservatives should also be applied during the assembly of parts which would afterwards be inaccessible or hidden from view.

Too often, in modern factories, the packing department was tucked away somewhere round the corner, looking like an untidy barn. The ideal packing plant was one where cleanliness and order prevailed, where packing was never done on the floor and where the packer was regarded as a skilled operative. Goods and packing materials should never get mixed and should reach the point of packing within arm's reach of the packer.

Great economy was possible by the elimination of unnecessary protrusions. A certain type of machine had eight bolting-down lugs protruding from the base. If bolt holes were incorporated in the base, 4 in. would be taken off each dimension, resulting in a saving of £2000 a year in shipping costs.

It was in production that the cure for many packing ailments could be applied first, and most effectively.

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* "The Place of Packing on the Production Line," by Mr. John E. Evan Cook, joint managing director, Evan Cook's, Packers, Ltd.

Availability and Uses of the World's Raw Materials

THE importance of world sources of supply of the main materials of industry is recognised in a new series of booklets being issued by the Purchasing Officers' Association.

Although primarily designed to cover the syllabus of the association's final examination subject "Raw Materials (Economic and Geographical Survey)" the series provides useful factual information of interest in a much wider field.

Raw materials of the iron and steel industry are the subject of the first booklet by A. K. Osborne. The principal materials are dealt with, providing in concise form a description of their sources, availability, consumption and a brief outline of methods by which they are produced and their main applications.

Some metals, usually regarded as non-ferrous, have been included under the heading "miscellaneous," being considered from the importance of their application as alloying elements in iron and steel manufacture.

Petroleum reserves, production methods, refining, and its consumption, utilisation and transportation are dealt with in booklet No. 2, by George Sell.

The third of the booklets now available is by H. R. Humphries and is concerned with animal feeding stuffs of the concentrated type. It covers cereals (such as maize, oats, barley and non-millable wheat); cereal by-products, etc.

Fundamentals of Modern Soil Chemistry

Genesis and Development of Bernard Dyer's Principles

THE comparative novelty of some established principles of soil chemistry and the character of the man who initiated important phases of it were recalled in London recently by Sir John Russell, F.R.S. He was presenting before the Society of Public Analysts and Other Analytical Chemists the first Bernard Dyer Memorial Lecture, commemorating the distinguished analytical chemist whom he knew for some 50 years.

Phosphorus and Potassium

One of Dr. Dyer's earliest achievements, said Sir John Russell, was in the determination of available phosphorus and potassium in soil by preliminary extraction with a 1 per cent solution of citric acid. It was the subject of the thesis for which he was awarded his doctorate by the University of London, and of important confirmatory work which he carried out later at Rothamsted. The speaker went on to describe the widening interest in soil chemistry, reflected ultimately by the creation of the Agricultural Research Council.

The processes by which plant roots take up their nutrients from the soil, said Sir John Russell, has been shown to be much more complex than was at first thought; and what is "available" to one plant may not be "available" to another.

The present-day problem was to find analytical methods that would give some measure of the amount of nutrients that crops, under normal conditions, could obtain from the soil.

Dyer's method came into wide but not universal use. Other solvents, in steadily increasing numbers, had been proposed but no two gave the same results.

This problem has been taken up at Rothamsted by J. A. Prescott and the lecturer, who found that when dilute acids act on soils, two reactions proceed simultaneously; the acid dissolves phosphate, but the soil slowly absorbs it from the solution.

This back-action is eliminated by using a diffusion technique, which shows that tenth normal citric, hydrochloric and nitric acids all extracted the same amount of phosphorous; whereas by the ordinary analytical method the citric acid extracts nearly twice as much as the hydrochloric aid and 50 per cent more than the nitric acid. The citric acid does this because it reduces the difference between the amount extracted by the acid and the amount reabsorbed by the soil.

Only the direct action is wanted by the analyst, the second action upsets his results. So long as he is dealing with similar soils he can assume that the reverse action is also somewhat similar and that his results will still be comparable; but when he is dealing with different soils the reverse action may be different and he may get different analytical results, even though the same amounts of phosphorus have been extracted. Standards applied to one soil cannot necessarily be applied to another.

Modern developments in technique have profoundly changed the whole subject. Citric acid long retained its popularity because it extracted easily weighable amounts of phosphoric oxide and of potassium. This advantage was lost with the use of modern turbimetric, colorimetric and spectrographic methods, with their ability to deal with amounts too small to be satisfactorily weighed.

These new methods, along with automatic balances and pipettes, have speeded up analytical determinations enormously and vastly increased the number of analyses that can be undertaken.

Field Experiments

We have to-day obviously gone a long way from the ideas that formed the background of Dyer's early work. The methods are at present empirical, so that the analyst needs close contact with field experiments to satisfy himself that they are reliable. He has to have a mind sufficiently open to reject them when they ceased to be so, and sufficiently alert to devise others that would be better.

That, however, is no new situation for a consulting chemist. His work lies largely in regions not yet tidied up by the science of the day; his equipment has always to be a wide knowledge of scientific methods combined with ingenuity of invention, soundness of judgment and complete intellectual integrity.

It is because Bernard Dyer possessed these qualities in so marked a degree that they honoured his memory.

STABILITY OF POWDERS AND EXPLOSIVES

New Belgian Quantitative Method

IN a brief review of the theory of stability of powders and explosives, R. Leclercq (*L'Industrie Chimique Belge*, 1950, *15* (1), 3-10 (January)) describes a quantitative method of investigation. The author and his co-workers are members of the staff of the Laboratoire du Service d'Inspection des Poudres de Guerre (SIPEG), Zwijndrecht-Fort, Belgium.

Twelve of the many existing methods are noted, including the silvered vessel test, the vacuum test, those of Abel, Vieille, Taliani, Bergmann-Yunk, Hansen, Rouvillois and others, and the relevant literature. These have all been critically examined and the methods are regarded as unsatisfactory in one or other respect.

Before the war, the most reliable method was considered by SIPEG to be that of Vieille—colouring litmus paper—but this cannot be used with some of the new powders, *e.g.*, those containing nitroguanidine up to 50 per cent. Moreover, those containing dinitrotoluene up to several per cent stain litmus paper yellow. Nor was the Abel test with iodised starch paper much better with some of the new powders.

The author notes several earlier papers published in *Mem. Poudres, Mem. Art France, Zt. f. Ges. Schiess. u. Spreng* (1919-1935). It was decided that a heating temperature of 90°C. was high enough to yield rapid results and low enough to avoid undesirable reactions, and was also suitable for powders whether or not they contained nitroglycerin.

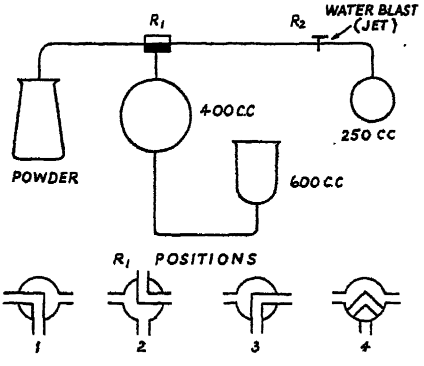
Humidity Factor

It was desirable also to eliminate the humidity factor, *e.g.*, by establishing in a Regnault atmosphere at 70 per cent, and to secure uniformity in shape by reducing to small cubes or even powder. The amount of NO and NO_2 set free in a given time affords a good measure of decomposition rate. The general aim was to have a sufficiently sensitive determination of the nitrogen oxides to avoid over-heating or prolonged working.

Three samples each of 10 g. after the Regnault treatment were heated to 90°C. during consecutive periods of three hours, and the gas recovered after each heating. For the heating an electric hot cupboard or glycerin-water bath was used, into which the vessels containing sample could be inserted. After recovering the gas these vessels are removed into contact with outside air for about 45 minutes. The hot chamber was designed after that of Vieille, in which a uniform temperature could be ensured by convection currents (Fig. 1, 2, and 3 in original).

The total NO and NO_2 recovered was determined by the Ilosvay reagent (Patty and Petty, *J. Ind. Hyg. Toxicol,* 1943, *25,* 361-5). Conversion of NO to NO_2 was nearly quantitative if, in addition to the prolonged contact with the heated interior for 23 hours, a further contact of 10 min. at ordinary temperature in the vessel containing reagent was made. Analysis was effected either with a colorimeter or spectro-photometer, and NO percentages as function of time were graphed. The reagent was prepared from solutions of naphthylamine and of sulphanilic acid in aqueous glacial acetic acid, and the standard solution was sodium nitrite dissolved in twice-distilled water kept for three months or more.

Extraction is described in connection with Fig. 4 (of original) reproduced here.



The 250 c.c. flask containing the Ilosvay reagent is connected with a water blast through R_2 where a vacuum of about 20 cm. is made, while R_1 is in the first position. Through R_2 again flask 250 c.c. connects with flask 400 c.c. and vacuum is broken.

By suitable manipulation of the 600 c.c. container, pressure control, and changing positions of R_1 as shown, four complete extractions may be made, after which the mercury is forced against and closes R_2. Flask 250 c.c. is removed and well shaken

(*continued overleaf*)

Production of Technical Argon

Progressive Fractionation Methods Discussed

MODERN practice in the production of technical argon was discussed in a paper presented at the meeting in Manchester on March 18 of the North-Western Branch of the Institution of Chemical Engineers. The contributors were J. B. Axon, M. Pearce and M. Ruhemann.

Describing the properties of argon, nitrogen and oxygen at low temperatures, Dr. Ruhemann, who read the paper, observed that the thermal properties of argon are closer to those of oxygen than to those of nitrogen. Air contains 0.93 per cent by volume of argon and technical argon contains small concentrations of oxygen and varying concentrations of nitrogen.

Liquid air is fractionated for the production of industrial oxygen in two columns, the lower one operates at 5.5 atmospheres abs. pressure and produces "rich" liquid, containing about 40 per cent oxygen, and a "poor" liquid which is nearly pure nitrogen.

The upper column operates at just over 1 atmosphere abs. pressure and produces oxygen at the bottom and nitrogen at the top. The upper column takes "rich" liquid as feed at the correct plate and uses "poor" liquid as reflux. The reflux condenser for the lower column acts as reboiler for the oxygen at the bottom of the upper column.

Technical argon is produced in a third fractionating column, the liquid or vapour feed is taken from a plate below the feed plate of the upper column and contains very little nitrogen, nearly 10 per cent argon and oxygen.

Three types of reflux for the argon column have proved effective; the first uses the argon product compressed to a liquid in the bottom of the argon column; for the second gaseous nitrogen from the evaporator-condenser of the main air column is condensed in the re-boiler of the argon column; and in the third type 90 per cent argon product is condensed by "rich" liquid which is passing to the feed plate of the upper column.

The feed for the argon column with the third type of reflux enters at the bottom of the column and the bottom liquid product is returned to the main column. Weishaupt's vapour-liquid equilibria were used for plate-to-plate calculations for the argon column with the third type of reflux.

Dr. Ruhemann discussed the design of the argon column with the third type of reflux. He showed the advantage of the use of "rich" liquid to condense the reflux, the dependence of the reflux ratio on the concentration of argon in the feed and in the overhead product, and the increase in nitrogen concentration from plate to plate up the column.

This increase limits the point in the main column from which the feed is taken. The position of the "rich" liquid feed plate on the upper column was shown by plate-to-plate calculations to be very critical. Any oxygen in the argon product is separated by chemical means.

STABILITY OF POWDERS

(*continued from previous page*)

to ensure that the reagent dissolves all the NO_2. The whole is then restored to atmospheric pressure.

For these various operations the powder receptacles are retained in the hot chamber. Determinations are made with a Duboscq colorimeter 10 min. after extraction (Patty and Petty *loc. cit.*). Tests were made with cotton (CP) and BCNL powders. It is thought, however, that the application of the method to explosives is of greater interest than to powders, and some preliminary results are said to be encouraging.

Belgian Metal Industries

AN ample review of Belgium's rising capacity for metal production will form one of the principal themes of the Liege International Fair (April 29-May 14). Exhibits will represent all phases of metal production and use, from raw material to finished goods. During 1949 Belgian non-ferrous metals industry produced (all metric tons) 138,443 tons of copper, 175,568 tons of zinc, 79,304 tons of lead, 10,408 tons of tin, and 5667 of sundry other metals, a total of 405,390 tons.

Semi-finished products represented 72,484 tons of copper, 82,889 tons of zinc, 21,896 tons of lead, 1097 tons of tin, and 6179 tons of other non-ferrous metals.

U.S. STUDIES OF AIR POLLUTION

Elaborate Equipment to Analyse "Smog"

THE co-existence in Great Britain and the U.S.A. of more or less parallel problems resulting from the loading of the atmosphere with solid, and sometimes toxic, matter has called forth substantial preventive research programmes in both countries. The work at the principal British centre at Porton, near Salisbury, has been referred to frequently. The parallel work in the U.S.A. is of almost equal interest.

The Stanford Research Institute in California has established a special chemical research laboratory, under the leadership of Paul L. Magill, senior chemical engineer, and the principal smoke research chemist in the U.S.A., known as the Air and Water Pollution Chemical Research Laboratory, in which a thorough physical and chemical investigation is being carried out.

" Smog " characteristically manifests itself in two principal ways: by causing eye irritation and by sharply reducing visibility. A portion of the reduction in visibility is known to be caused by natural haze in the air, and another part by contaminants emitted in the course of the diverse activities of a great city.

Sulphur Trioxide

In the Los Angeles area—which is unique in that it is by far the largest industrial sub-tropical urban area in the world—the problem of how to assess the quantities of some of these contaminants was encountered. The substance to which much attention has been given is sulphur trioxide, which is sometimes present in relatively large volumes in the Los Angeles atmosphere. Qualitatively, its fog-producing properties were well known. Little was known, however, of the quantitative relationship between sulphur trioxide concentration, relative humidity, and visual range.

To study these relationships it was necessary to design equipment capable of measuring, under controlled conditions, the decrease in intensity of a light beam travelling through long paths of air polluted with low concentrations of the atmospheric impurities, including sulphur trioxide. The development of the " transmissometer," now operating in the Air and Water Pollution Chemical Laboratory, was one result.

The transmissometer's complete system includes a 40-foot-long chamber through which the test air passes, apparatus for generating and mixing in the desired amount of contaminant and a light source which sends out a beam of modulated light of constant intensity. A system of mirrors reflects the light beam back and forth through the full length of the chamber until it meets an analyser which measures its final intensity.

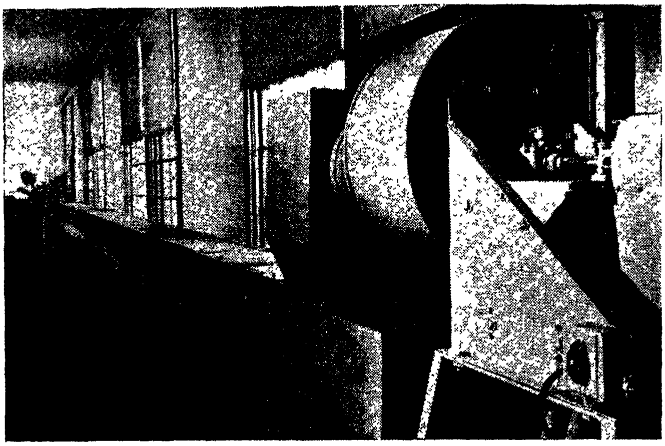
This apparatus scrubs the air with water to collect a sample of airborne dust and mist

Reproduced Contamination

By adjusting the rate of addition of a contaminant to the rate of air flow through the chamber, research chemists can reproduce concentrations of the magnitude found in the Los Angeles atmosphere.

The outgoing beam of light is interrupted at a frequency of 1080 cycles per second, and the analyser is tuned to respond only to light of that frequency. It is possible thus to eliminate the variable effects which sunlight or other stray light might have on the readings of the analyser.

The reflecting system is composed of three spherically ground, polished mirrors of 20-foot focal length. Two are placed side-by-side at one end of the air chamber and the third at the other end. By slight adjustment of the positions of these mirrors, the light beam can be made to travel the length of the chamber four,



From the far end of the 40-ft. air chamber an operator controls the flow of test air to the blower-exhaust section of the Stanford Research Institute's transmissometer

eight or any multiple of four times before reaching the analyser.

In earlier measurements made with light paths of 80 ft., it was found, for example, that 0.1 of a part per million of sulphur trioxide was sufficient to reduce the visibility to about 0.7 mile at 55 per cent relative humidity. The same concentration of sulphur trioxide at 90 per cent relative humidity reduced the visibility to one-half that distance.

Since 0.1 part per million represents about the upper limit of sulphur trioxide concentrations actually found in the Los Angeles atmosphere, the most recent tests have been made to extend the measurements to lower concentrations. Thus, even though the effect of low concentrations on a light beam travelling 40 or 80 ft. may be negligible, by using mirrors to make the path twenty times as long (800 ft.), the effect is magnified sufficiently to be easily measurable with accuracy. Experiments on these lines are now in progress. The analyser is a photo-electric tube on which the light beam falls; an amplifier which is tuned to the frequency of the light beam and which amplifies the output of the phototube; and a recording potentiometer which makes a permanent record of the light intensity.

In practice, the intensity of light is measured after it has passed through approximately 800 ft. of clear air. Then the desired concentration of contaminant is introduced and the light intensity measured again. This affords reliable data on the ratio between visibility and given quantities of atmospheric contaminant.

The transmissometer has been proved practical for determining how greatly given concentrations of sulphur trioxide—or any other impurity—affect visibility. By repeating the test under different relative humidity conditions, research chemists of the Stanford Research Institute have also been able to measure the effect of moisture in producing dense industrial atmospheres, to prevent which increasing research in Britain and America is being devoted.

Fluorocarbon Plastics for U.S. Industries

THE rapid exploitation in the U.S.A. of the corrosion and heat resistance and some other special properties of fluorocarbon plastic, a polymer of trifluorochloroethylene, has been demonstrated at the Chicago Plastics Exhibition, which opened this week. The adaptability conferred by the properties of the chlorine constituent has been well brought out by the M. W. Kellogg Company's large range of components, in which the thermoplastic (KEL-F) is moulded by the standard methods, and appears also as waxes, greases and oils of polymers of low molecular weight.

Among the actual applications are KEL-F-lined hose and special, soft-pressed seal rings made from graphite, asbestos, and KEL-F for use as centrifugal pump shaft packing. Others include KEL-F-coated high-temperature radio hook-up wire made by two different concerns, hermetically sealed transformer terminals, special gaskets, O and V rings, U cups and diaphragms for special pumps.

A relatively new fluorocarbon-type plastic, KEL-F was developed during the search for corrosion-resistant materials.

DUST AND FUME CONTROL

Automatic Filtration and Recovery

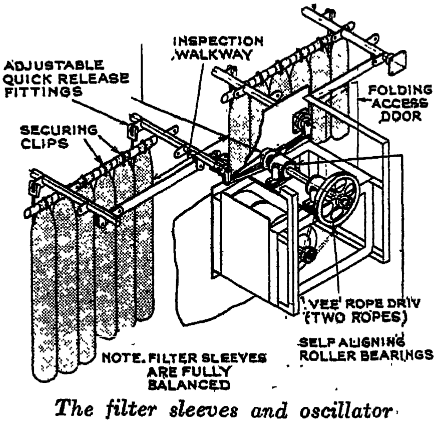
THE operating principles of modernised plant for the control and recovery of dust and fumes in chemical works, etc., are now fully described in a booklet published recently by the Power-Gas Corporation, Ltd. This specification of P-G-Dracco equipment (MB type) is an elaboration of the general information contained in a similar publication released last year (THE CHEMICAL AGE, *60*, 865).

The basic principle of the plant is the system of fabric filtration, whereby the gas or fume is passed at a carefully determined velocity through a closely woven fabric medium, upon which the entrained solids are deposited.

The dust laden gases pass along the inlet manifold to an expansion chamber of each hopper, where the larger particles settle out. The finer particles rise with the gas into the filter sleeves, where they are retained on the inside surface, while the filtered gas passes through the outlet valves to the outlet manifold.

At intervals determined by the setting of the cyclic control unit the flow of gas through each compartment is interrupted by the closure of the automatic isolating valve. The filter sleeves are subjected to a vigorous shaking action and the dislodged dust settles rapidly in the hopper.

If a subsidiary valve is fitted, clean air or gas passes in a reverse direction through the sleeves, greatly assisting the dislodgement and settling of the dust. The vibrating unit then stops and the valve opens again, ready for further use. After a suitable interval, the next compartment goes through the same cycle.


INSPECTION WALKWAY
ADJUSTABLE QUICK RELEASE FITTINGS
SECURING CLIPS
FOLDING ACCESS DOOR
'VEE' ROPE DRIV (TWO ROPES)
SELF ALIGNING ROLLER BEARINGS
NOTE. FILTER SLEEVES ARE FULLY BALANCED

The filter sleeves and oscillator

TREATED WATER SPRAY

Protection from Air-Borne Dusts

The diaphragm and injector

SUPPRESSION of dust in mines, quarries and many other industrial activities has long been a primary subject of research. The reduction of the incidence of silicosis and pneumokoniosis has provided one of the principal incentives. Increasing mechanisation in British mines has aggravated the dust problem, but in many instances machines equipped with jets or sprays are contributing a solution.

The extensive use of water in coal mines is, however, not without serious disadvantages such as that of swelling of the floor ("pucking"), or the formation of pools.

Progress towards a solution of the problem is shown in the Teepol injector, which, after searching tests of prototypes by the Ministry of Fuel and Power, is now coming into use in British collieries.

One of the main obstacles to the use of wetting agents for dust suppression in mines has, in the past, been the difficulty of maintaining a constant flow of treated

(*continued at foot of next page*)

Technical Publications

THE National Smoke Abatement Society this year celebrates its coming of age and the Spring, 1950, issue of its journal "Smokeless Air" is the first of two issues which survey its progress since 1929. The main feature deals with a review of the preliminary report by the Public Health Service of the U.S. Federal Security Agency on the Donora "smog" disaster of 1948. The biological aspect is covered by Dr. J. S. G. Burnett, Medical Officer of Health for Preston, and Dr. A. R. Meetham, of the National Physical Laboratory, formerly superintendent of observations for the investigation of atmospheric pollution DSIR, deals with the atmospheric studies.

* * *

DIFFERING compositions and temper of aluminium and aluminium alloys are described in "The Properties of Aluminium and Its Alloys," information bulletin No. 2 now available from the Aluminium Development Association. The booklet covers main groups of materials and types of heat treatment; specifications; physical and mechanical properties; durability and working methods.

* * *

COMMON faults that can occur in arc welds in mild and low alloy steels are defined and illustrated in the main feature of "Welding Research" (Vol. 4, No. 1), journal of the British Welding Research Association, and there is a résumé of recent published information on the flash and butt welding of light alloys.

* * *

ONE result of the co-operative research between the Road Research Laboratory of the DSIR and the British Road Tar Association has been the development of dense tar surfacing. Typical specifications intended to serve as a guide to manufacturers and users of the material have now been issued by the association.

* * *

A DICTIONARY of Colours for Interior Decoration has now been produced by the British Colour Council to facilitate colour co-ordination and to give authoritative references and illustrations to colours regularly used in the materials prepared to-day. The work is in three volumes, the first two being devoted to 378 colours on three surfaces, gloss, matt and pile fabric, while the third contains an index of 500 names cross-referenced with the other volumes.

PARTICULARS of the fine and special steels being produced in France are given in a book "Les Acier Fins et Spéciaux Francais," produced by the Chambre Syndicate des Producteurs d'Aciers Fins et Spéciaux. Its usefulness is enhanced by the inclusion of a dictionary of technical terms in English, French, German and Spanish.

* * *

AN improvement of Herold's method of phase reversal, resulting in a still higher value of the conversion transconductance is studied by G. Diemer and K. S. Knol in "Philips Research Reports" (Vol. 4, No. 3; Philips Electrical, Ltd.). Other features deal with ionospheric double refraction (H. Bremmer); high-pressure rare gas discharges (W. Elenbaas); and proposals and recommendations concerning the definitions and units of electromagnetic quantities (P. Cornelius).

TREATED WATER SPRAY

(continued from previous page)

water of the correct strength at operating points. Particular attention has been given to this in the design of the new injector, which has been built and developed by the Permutit Co., Ltd., in collaboration with the chemists and engineers of Shell Chemicals, Ltd.

The injector, by the introduction into water systems of controlled quantities of wetting agent (Teepol) reduces by as much as 50 per cent the quantity of water required. The equipment consists essentially of a venturi throat and a dual container. The dual container comprises two bowl-shaped vessels about 2 ft. in diameter, bolted rim to rim, separated by an internal rubber diaphragm.

As water from the main flows through the venturi, pressure created at the throat forces a trickle of water into the water-containing side of the container. This slowly pushes the diaphragm towards the side containing the wetting agent, so that the latter is gradually forced into the low-pressure side of the venturi, to mix with the main flow of water.

Full details of this new system are given in "The Suppression of Dust in Coal Mines," now available from Shell Chemicals, Ltd.

Metallurgical Section

Published the first Saturday in the month

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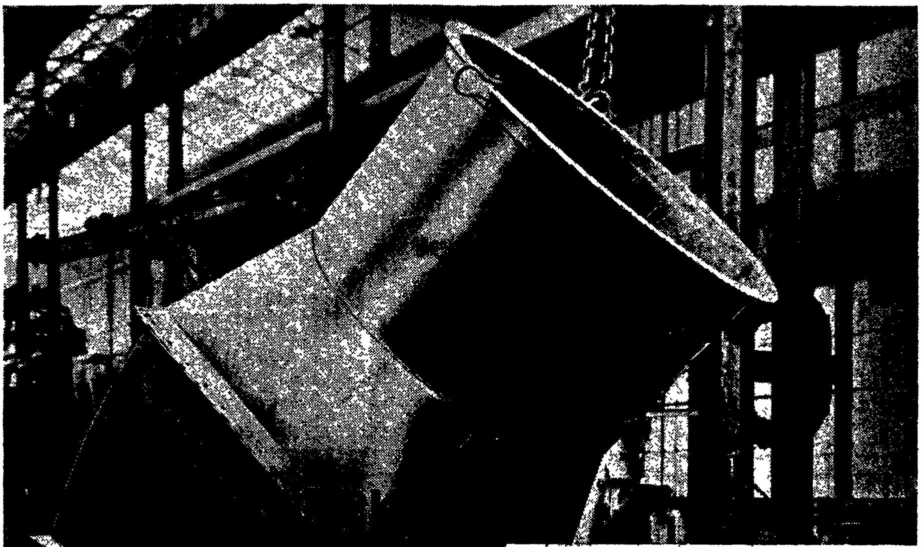

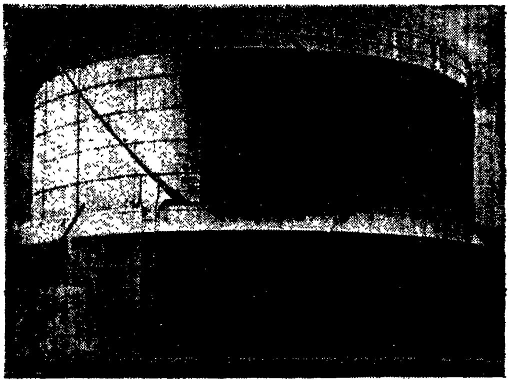

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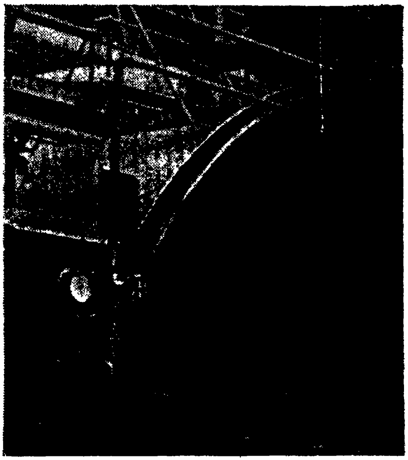

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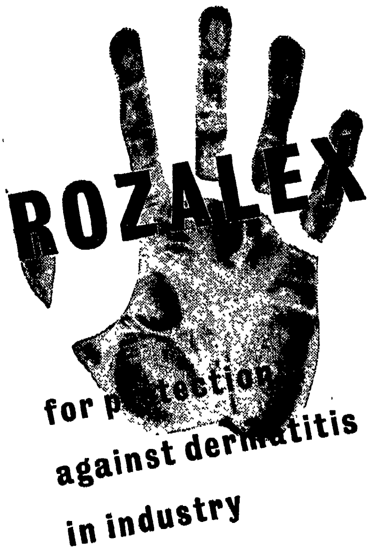

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Metallurgical Section

1 April 1950

U.S. TITANIUM PROGRESS

Prospects of Hastening Commercial Developments

RATHER less than two years have elapsed since the strong, durable and corrosion-resistant metal, titanium, began to attract significant commercial attention. While it is still a youngster whose potentialities have still largely to be determined by laboratory research, the next decade is generally expected to see this newcomer grow in importance and acquire as wide a standing as the universally-used metals.

Titanium, discovered in Cornwall in 1790 by William Gregor, an English vicar who also distinguished himself as a mathematician and mineralogist, did not find any practical applications until after World War I. Then some titanium pigments were commercially introduced. Large advances have been made since, and today many of the best paints contain titanium dioxide refined from the minerals ilmenite or rutile.

Chemically, the element is about in the middle of the periodic table, being grouped with zirconium, cerium and thorium. It has an atomic weight of about 48 and melting point of 1800° C., which is nearly the same as of platinum. The high melting characteristic was familiar in the past, when titanium's presence in many iron ore deposits made them unpopular because the ores could not be smelted by standard blast furnace methods. Now it is encouraging to observe that Dr. E. A. Gee, of the E. I. du Pont organisation in the U.S.A., is optimistic about the possibility of attaining tonnage production of titanium metal.

Promising Investment

It was anticipated at a recent national meeting of the American Chemical Society that several years may be required to establish fully what are the potential market factors. Chemists reported that they were improving the ingot process which du Pont developed about a year ago. Titanium research is an impressive example of how business enterprises in Britain and the U.S.A. are investing in projects which are likely to result in new products and new markets. The development may also help to conserve other metals of which reserves show signs of depletion.

Progress has been reported in the use of titanium as an addition to steel to facilitate deep stamping, to inhibit corrosion, and to increase tinning and galvanising capacity. It confers certain desired features on cast iron, hard carbide alloys and welding rods, but little is known about its alloying capabilities.

There are indications of possible wide usage on jet aircraft engine parts and structural members of machines. Inferences have been made upon its potential strategic importance, but until the recent publication of Barksdale's excellent book "Titanium," little systematically collected information was available.

Reduction of Costs

The present price of titanium ingots of uniform and good quality continues to limit the consumer fields. Alex Stewart, director of research of the U.S. National Lead Co., has recently recorded that the major concern of present research was to reduce costs.

Further indications of the prospects of the metal in the U.S.A. have been provided by an exploratory study of a titanium deposit in Hot Spring County, Arkansas, conducted by the Bureau of Mines, by which it has been described. As part of the programme for developing titanium metal, research is now going forward at the Mississippi Valley Experimental Station to develop methods of concentrating and utilising Arkansas ores.

This publication also gives the results of metallurgical tests made by the Bureau, and discusses the history of various deposits and the character of the ore.

(Report of Investigations 4592, "Investigation of Christy Titanium Deposit Hot Spring County, Ark.," by Donald F. Reed; the Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa., U.S.A.)

Zirconium and Its Compounds

Recent Development of their Industrial Uses

UNTIL comparatively recently, zirconium was regarded as a rare metal, although it has been estimated that it is almost as abundant in the earth's crust as carbon.

Concurrent industrial use of titanium-bearing sands of Florida led to the separation of large quantities of zircon as a by-product, states Mr. W. B. Blumenthal, chief chemist of the Titanium Alloy Manufacturing Division of the National Lead Company (U.S.A.) in an article in *Chemical Industries*.

Replacing Tin Dioxide

Mr. Blumenthal states that his company, developed a zirconium dioxide ceramic opacifier which served initially as a substitute for tin dioxide, then scarce and expensive. The new product contained 90 per cent zirconium dioxide. Later another opacifier, consisting of 98.5 per cent zirconium dioxide, was offered to the ceramic industry.

Zircon, too, was found excellent for use in frits to produce opacity, replacing antimony oxide for this purpose. Conversion of zircon to double silicates of zirconium and certain elements of Groups 1 and 11 formed products particularly useful in ceramic glazes and zircon porcelains.

The researches during World War I developed industrial methods for producing soluble salts of zirconium, such as chlorides, sulphates and acetates, but a sizeable demand for these salts did not arise for several decades.

A passing interest in zirconium salts for use in silk weighting occurred in the late twenties.

During the 'thirties there was a great growth of the zirconium ceramic industry and the beginnings of the growth of a stable zirconium chemical industry. Both had assumed considerable importance by the end of World War II, although sales of zirconium chemicals were only a small fraction of those of ceramic products.

World production of zirconium concentrates in 1946 was 25,000 short tons. Of this, 6400 tons were obtained from a 50-mile stretch of Australian beach between Byron Bay, New South Wales, and Southport, Queensland.

The ceramic uses of zircon and zirconia arise from the high reflectivity of light, high melting point and thermal stability, chemical inertness (particularly of zircon) and high specific gravity. As refractories, they are used not only in crucibles, furnace construction and insulation for electric heating elements, but more recently in jet engine exhausts.

Some of the more important applications are melting aluminium, production of metaphosphates, smelting of glass and of raw mixtures for enamel and glaze frits, ramming mixtures in induction furnaces and furnace blocks. In melting aluminium the resistance of the zircon to " wetting " by the molten aluminium is the primary advantage.

Chemical inertness is an additional asset and permits the construction of equipment where extreme resistance to chemical action is required. An example is in the construction of rotary calciners where acidic materials must be handled. The high specific gravity of zircon is particularly useful in crucibles for melting aluminium, because spalls and fragments of the crucible material settle to the bottom instead of floating in it.

Improved Refractories

Until recently zirconia refractories suffered from lack of resistance to thermal shock due to a change in crystalline form at about 1000°C. Now thermal shock stability has been achieved by addition of small quantities of lime and magnesia.

The complexity of the chemistry of zirconium is responsible for its usefulness in chemical industry, where it can function because of its amphoteric nature, its large covalency, and the unusual variety of ions it is able to form.

The largest consumption of soluble zirconium compounds is to render textiles water-repellent. The second largest use of zirconium salts in 1948 was manufacture of pigments. Zirconium is a precipitant for acid dyestuffs, and, when properly controlled, coloured pigments of excellent general properties and outstanding tinctorial strength are obtained. These are particularly suitable for printing inks.

Zirconium salts also tan leather; the sulphate has been found most satisfactory. Other present or prospective uses of zirconium chemicals are in the mordanting of textiles, preparing incandescent gas mantles, catalysing organic synthesis and hydrocarbon cracking, and in medicine.

NEW STEEL CAPACITY

Full Equipment at Scunthorpe

HIGHER output and greater economy and efficiency, to which a good deal of ancillary chemical process equipment will contribute, are among the benefits likely to accrue from the development programme of John Lysaght's Scunthorpe Works, Ltd., now nearing completion.

Additions to by-product recovery plant and erection of an electrostatic plant to clean 10 million cu. ft. of gas an hour from the blast furnaces will ensure that the iron and steel making operations do not lose the benefit of any of the incidental products.

A modern, continuous mill, capable of producing 9000 tons of billets a week, should be in operation by the end of June.

Steel-making capacity, which is to be increased 50 per cent, will be served by an additional 120-ton furnace and the enlargement of three 65-ton furnaces to 120 tons.

Other new equipment will include four 175-ton electric overhead cranes, a mould-conditioning shop, and a gantry with three 15-ton overhead cranes for scrap.

A cogging mill, to roll 4-ton ingots, will be powered by a 6650 h.p. electric motor, and a six-stand continuous mill, powered by a 4000 h.p. motor, will roll steel billets.

The whole development is described as one of the largest undertaken in a British iron and steel works. Another plant, to make rods, will start in 1951.

PRACTICAL RESEARCH

BISRA's Steelworks in Miniature

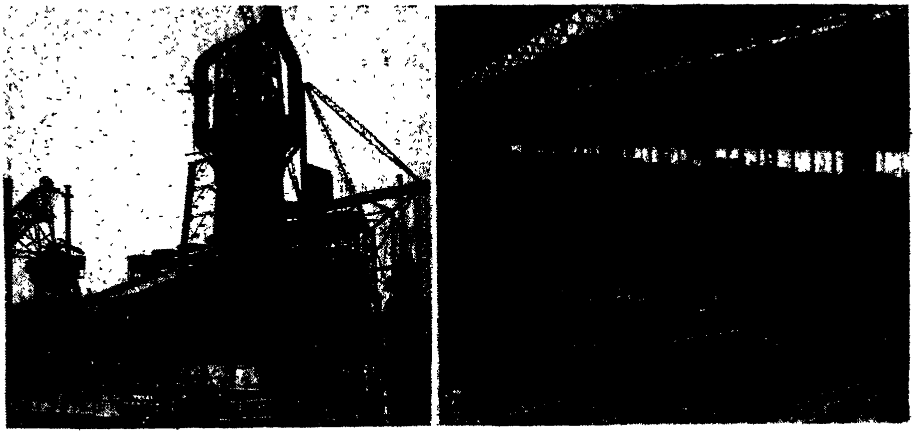
A NEW technique in steel research, a station that will have much of the equipment of a steelworks in miniature, is being adopted by the British Iron and Steel Research Association in Sheffield during the next few months. Pilot steelworks plant for melting, rolling, drawing and forging, to try out research results before application to production plant, is to be installed in buildings to be erected on a 2¼ acre site at Hoyle Street.

Steel melting will be carried out in a 10-cwt. capacity electric arc furnace, which will be used for work on sulphur elimination and on electric furnace practice.

A high-speed 14 in. 4-high cold strip rolling mill will enable BISRA's research staffs to carry further their investigations into such things as "roll force," the measurement of which gives rolling mill makers and users the equivalent of the boiler engineer's steam pressure gauge in working out safe and economical loads. On a smaller 2-high mill valuable work has already been done by BISRA's rolling section.

BISRA will have its own experimental wire drawing plant in the new buildings, where it will be possible to carry out trials of new processes before they go on to the full scale production plant.

The new buildings, to cover 38,000 sq. ft., will cost about £250,000.



Indicating the scope of the £9.5 million development at John Lysaght's Scunthorpe Works, Ltd., are (left) the company's new blast furnace, in course of construction, and (right) the rolling mill building, in which is housed the Morgan continuous billet mill

Nickel-Clad Steel

Simplified Engineering for Corrosion Resisting Vessels

A COMMON chemical engineering problem concerned with the discriminating choice of materials is presented in the construction of beet sugar extraction plant. The contribution made by nickel to its solution is the subject of technical notes which appear in the current issue of *The Nickel Bulletin* (**23**, No. 2, 26).

This describes the work of Cocksedge & Co., Ltd., in carrying out repairs on plant which, after the war, could not have competed with the cane sugar industry.

The company, which manufactures diffusion batteries in which the sugar is extracted from the shredded beet, uses nickel-clad steel for the diffusers and claims that this material is both corrosion resistant and relatively cheap.

A diffusion battery comprises 14 large pressure vessels, each holding 6 tons of beet. Hot water at about 200°F. is circulated through the diffusers in series, entering a unit containing beet from which most of the sugar has been extracted, and leaving from a unit charged with fresh beet. Such a battery operates 24 hours a day for over 100 days a year. Up to 1800 tons of beet a day can be handled by the largest batteries.

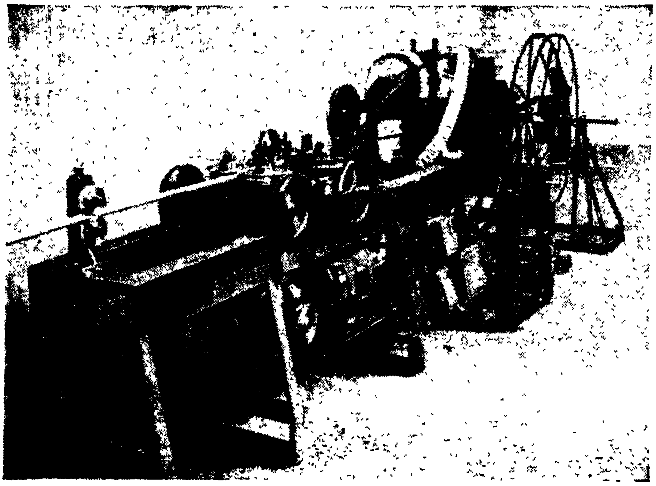
When the maximum amount of sugar has been extracted, the charge from the unit is pumped to filter presses. The liquor extracted is returned to the diffuser battery to reduce water consumpion, conserve heat and retrieve the sugar contained. This returned liquor is low in oxygen and slightly acid, and corrosive attack was experienced on the mild steel formerly used for diffuser bodies.

Nickel, in contact with the corrosive medium, and steel to carry the bulk of the stress are now indicated for construction of heavy equipment of this kind.

For the diffusers, $\frac{3}{8}$-in. nickel-clad steel plate with 10 per cent cladding was selected. Fabrication presented few difficulties and the facility with which nickel-clad steel can be handled is aided by the fabrication of the cone-shaped end sections. Each end section consists of 4 or 6 plates which are first hot-pressed to shape and then butted together for welding.

Welding is carried out on the steel side first, no V preparation being necessary. The nickel side is then carefully chipped away with a round-nosed chisel down to the steel weld to give a base of clean, sound metal. The sealing weld in the groove is made with a pure nickel rod, thereby ensuring a continuous nickel surface on the inside of the vessel. After construction, each diffuser is tested to 80 p.s.i.

Aluminium Sheathing of Cables



EQUIPMENT which promises to increase the use of aluminium to replace lead for the sheathing of electric cables and other purposes has been constructed by the Pirelli-General Cable Works, Ltd. (associate of G.E.C.), in whose research laboratories was developed the cold pressure welding process employed. Cable-sheathing by this method is claimed to be continuous, the aluminium strip being joined by brazing carried out without interfering with the welding process

CANADIAN NICKEL RESULTS

Cost and Market Fluctuations

THE reduction in net earnings of the International Nickel Company of Canada, Ltd., during 1949 seems to have represented factors common to many overseas metal enterprises. It was attributed by the chairman, Mr. Robert C. Stanley, largely to increased costs of labour, supplies and services and a fluctuating demand for the metal in the U.S.A. The lower prices for copper and platinum metals were other contributory factors.

Proven ore reserves at the end of the year were 251,805,000 short tons, compared with 246,177,000 at the end of 1948, and the nickel-copper content was 7,630,000 tons, compared with 7,503,000 the previous year.

Underground development in the operating mines extended a further 84,654 ft., bringing the total development to more than 266 miles.

Progress was reported on the project for the mining of lower grade ores from the Creighton Mine. A shaft is being sunk approximately 2000 ft. and a new concentrator, under construction, should be completed by 1951. The concentrator will have a capacity of 6000 tons per day and will supply the concentrate by pipeline to Copper Cliff, about 7½ miles distant.

Capital expenditure in 1950, estimated at $22 million, will be required to expand mining activity on the completion of the open pit working at Frood-Stobie, to finish the construction of plant for oxygen flash smelting of copper concentrates and to provide more housing for staff.

Natural Gas for Aluminium

THE Aluminum Company of America has begun operations at its new Point Comfort Reduction Works, near Port Lavaca, Texas, which is designed to produce 110 million lb. of aluminium per year. Natural gas will serve as the chief source of power for the electric generating equipment, which will have at total of 80,000 kW installed capacity, using more than 30 million cu. ft. of natural gas each day to power 120 internal combustion engines. Installations include a plant for the manufacture of carbon electrodes required in the electrolytic aluminium-producing process, and a reduction plant in which aluminium will be produced from purified aluminium ore. Aluminium is produced at Point Comfort fundamentally by the same process as that discovered in 1886 by Charles Martin Hall.

STEEL TECHNOLOGY

Some U.S. Advances in 1949

THE United States, by far the largest of the world's producers of steel, made good progress during 1949 in putting into operation new units of the huge modernisation and improvement programme launched since the war.

This statement is made by the United States Steel Export Company in a report which describes some of the major advances in the technique of American steel production last year.

The Carnegie-Illinois Steel Corporation, after 10 years of experimentation, is prepared for commercial production of low carbon (0.03 per cent maximum) stainless steels, states the export company. These are claimed to have resistance to intergranular corrosion equal to that of 18-8 stainless steels to which columbium and titanium stabilisers have been added. Welding tests demonstrated that they can replace the stabilised types for applications such as welding, that involve short heating times in the sensitising temperature range.

The Geiger counter has been adapted by scientists of the Research Laboratory, United States Steel Corporation of Delaware, to develop a quick and accurate method of analysing steel samples. After careful calibration for many specific problems, Geiger counter analysis is expected to be faster than the direct-reading spectroscope.

A new system of sorting rapidly various grades of stainless steels and detecting residual elements was devised at the Wood Works of the Carnegie-Illinois corporation. The metal analyser consists of a fixed-deviation glass prism spectrometer, mounted on a portable cabinet. The visible range coincides with the visible range of the spectrum and may be increased by the use of photographic attachments.

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• PERSONAL •

DR. E. K. RIDEAL, lately director of the Davy Faraday Research Laboratory and Fullerian professor of chemistry in the Royal Institution, has been appointed to the chair of chemistry King's College, University of London, from August 1. His appointment, and that of MR. G. TYSER, to the board of Monsanto Chemicals, Ltd., has also been announced.

MR. BARRIE HEATH has been appointed to the board of Powell Duffryn Carbon Products, Ltd., as managing director. DR. D. B. FOSTER, of the company's research laboratories, has also joined the board.

COLONEL M. A. MCEVOY has joined the board of directors of Bamag, Ltd., London. He has been closely connected with heavy engineering for many years, and lately has travelled widely to ascertain what are the principal needs of foreign markets for British machinery.

MR. FRANK PARR, an executive of the British Iron and Steel Federation, is joining the Whitehead Iron & Steel Co., Ltd., and its associated companies as a special director.

LORD BOYD ORR, Chancellor of the University of Glasgow, and LADY BOYD ORR have accepted an invitation to attend the annual dinner associated with the Royal Institute of Chemistry's anniversary meetings in Glasgow (March 31-April 1).

MR. ROBERT H. S. ROBERTSON, the Glasgow consultant in raw material development, addressed the Dust Technique Group of the Society of German Engineers, at Duisberg, on March 30, on "The Micromeritics of Clay Minerals."

DR. N. H. HARTSHORNE, lecturer in chemical microscopy, University of Leeds, has been appointed to be reader in the same subject.

MR. NORMAN SHELDON has been re-elected chairman for 1950 of the British Chemical Ware Manufacturers' Association, Ltd.

At the recent annual general meeting of the Newcastle-on-Tyne Chemical Industry Club, the following officers and committee were elected for 1950/51: President: MR. A. TROBRIDGE; vice-presidents: PROF. G. R. CLEMO, MESSRS. CLIVE COOKSON, J. W. CRAGGS, B. H. HILL, R. H. F. HOUSTOUN, A. KELLY, H. DUNSFORD SMITH, S. A. WIKNER. Chairman: MR. W. S. COATES; hon. librarian: MR. S. IRVINE; hon. treasurer: MR. S. DAWSON; hon. secretary: MR. W. A. BRIGGS. Committee: MESSRS. F. W. BELL, L. BONSER, W. JEFFERY, J. MCMANUS, B. RICHARDSON, F. SCOTT, H. THOMPSON, H. F. WINSHIP.

MISS E. M. R. DITMAS has retired from the post of principal officer of the Association of Special Libraries and Information Bureaux in which she has served since 1933, as secretary and since 1946 as director. Miss Ditmas is succeeded by MR. LESLIE WILSON, a former scholar of Trinity Hall, Cambridge, and foreign editor of the *Times Educational Supplement.*

OBITUARY

THE death was reported this week of PROFESSOR CHARLES STANLEY GIBSON, Emeritus Professor of Chemistry in the University of London at Guy's Hospital Medical School.

The professor was born in Manchester in 1884 and educated at Corpus Christi College, Oxford, where he took an honours degree in chemistry in 1905. Four years later he was appointed senior research student of the Goldsmiths' Company at Oxford, and shortly afterwards obtained a post as assistant lecturer and demonstrator in Cambridge University chemical laboratory.

He spent a number of years abroad, first in India where he was appointed professor of chemistry at the Maharaja's College, Trivandrum, in 1912, and then in Egypt where he held the post of professor of chemistry at the Cairo School of Medicine from 1919-1920. In 1916 he was honorary adviser to the chemical warfare committee of the Ministry of Munitions. He became professor of chemistry at Guy's Hospital Medical School in 1921 and continued to serve there until recently.

Professor Gibson was honorary secretary of the Chemical Society from 1924 to 1933, and president of the chemistry section of the British Association meeting held at Cambridge in 1938. He was the author of "Essential Principles of Organic Chemistry" and wrote numerous papers, most of which were devoted to chemotherapy.

· HOME ·

Automatic Arc Welding

As from April 1, all sales and service for Unionmelt Automatic Arc Welding equipment in the United Kingdom will be handled by the Quasi-Arc Co., Ltd., at Bilston, Staffs.

Stress Analysis Conference

The fourth annual conference of the Stress Analysis Group of the Institute of Physics will be held at University College, London, from April 3-5. The conference will provide sessions on brittle lacquers, the use of models in structural work and the application of experimental stress-analysis methods to soil mechanics.

Suspension of Lead Rationing

From today (April 1) lead will be obtainable for consumption without restriction on the amount in a given period. The Ministry of Supply, making the announcement, states that the availability of larger supplies has made possible the suspension of rationing.

New Laboratories

Dr. V. E. Yarsley, consultant in plastics chemistry, has recently purchased Oaklands, Clayton Road, Hook, Surrey, to which, after modifications, the organic laboratory will be transferred from Walsall, Staffs., and the physical and surface coatings laboratories from Ewell. Later, the technological laboratories will follow.

£3 m. Oil Plan Postponed

Postponement of a £3 million scheme to establish an oil refinery at Tynemouth, as a result of the national policy of restriction on capital expenditure, is announced. A Ministry of Fuel spokesman states that there is no chance of the project starting this year and little chance next year. The scheme would have employed crude oil brought direct to the Tyne in tankers to an oil refinery to be established at East Howdon by Trent Oil Products.

Chemical Export Control

Some changes in export licensing control come into operation today (April 1). Among the goods which will not now require export licences are coal tar products (other than phenol) and a long list of drugs and pharmaceuticals. Liences will be required for certain additives to mineral oil, some specified plastic materials and certain drugs and chemicals. The last include aluminium chloride (anhydrous) barium nitrate and metallic sodium.

Export of Linseed Oil

A limited quantity of processed linseed oil is now being released for export, records a Press note from the Board of Trade. In addition, and in special cases, applications to export raw linseed oil in small quantities will be considered.

Coal Output Rises

Production of coal last week reached 4,380,710 tons (4,118,110 deep-mined and 262,600 opencast) compared with 4,289,000 tons in the corresponding week of last year. There were 700 fewer colliery workers.

New Telephone Numbers

W. & J. George & Becker, Ltd., the laboratory furnishers, of Hatton Wall, London, E.C.1, have added three telephone lines to their private branch exchange. The numbers are *HOLborn* 5483-5.

Continued Control of Molasses

A Press note from the Board of Trade on Wednesday reverses the announcement made on March 22 that molasses could be imported privately after April 1 (THE CHEMICAL AGE, 62, 393). The new statement indicates that the announcement was made in error.

Canadian Laboratory Contract

Baird & Tatlock (London), Ltd., has received the order to supply the metal unit laboratory furniture required for the first part of the new laboratories being constructed for the Department of Health in Ottawa. The order is understood to be worth about £19,000.

New Sales Office

The sales office of A. Boake, Roberts & Co., Ltd., at "Ellerslie," Buckhurst Hill, Essex, will be closed on April 14 and replaced by a new office at 100 Carpenters Road, Stratford, E.15 (MARyland 5511). This centralises all the company's office administration at Stratford.

1950 Trade with Poland

A trade agreement recently concluded with Poland provides for the purchase by this country from Poland of manufactured goods valued at £2.2 million. Among the most important of these are textiles, casein, chemicals, china and glassware, wrapping paper and board. British exports to Poland, estimated at £1.3 million, will include pharmaceuticals, insulating and pressure-sealing materials, engineers' and hand tools.

Next Week's Events

MONDAY, APRIL 3

Society of Chemical Industry

London: Main lecture theatre, Huxley Building, Exhibition Road, South Kensington, S.W.7, 2.15 p.m. and 5.15 p.m. (Two sessions). Symposium on " Distillation "; Prof. F. H. Garner: "Some Fundamental Problems in Distillation "; H. Kaye: " Recent Advances in Distillation in the Petroleum Industry"; C. W. Allen: " Distillation of Water "; C. R. Dobson: " The Distillation of Industrial Alcohol, present day practice."

Oil and Colour Chemists' Association

Hull: Royal Station Hotel, 6.30 p.m. Dr. D. R. Evans: " Some Aspects of the Protection of Iron and Steel Against Corrosion."

TUESDAY, APRIL 4

Chadwick Public Lecture

London: Livingstone Hall, 42 Broadway, Westminster, S.W.1, 2.30 p.m. Charles E. Scholefield: " Rivers Pollution and the River Boards Act, 1948."

Incorporated Plant Engineers

Cardiff: Grand Hotel, Westgate Street, 7.30 p.m. (South Wales Branch). Annual general meeting.

The Royal Institute of Chemistry

Liverpool: (Liverpool and North-Western Section), 7 p.m. Annual general meeting. Prof. F. S. Foweather: " The Laboratory Examination of Service Recruits."

THURSDAY, APRIL 6

Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. (Birmingham Local Section). Annual general meeting.

London: 4 Grosvenor Gardens, S.W.1, 7 p.m. Discussion on " Creep." Opening speaker: N. P. Allen.

The Chemical Society

Dundee: University College, 5.15 p.m. (St. Andrews and Dundee). Dr. F. S. Dainton: " Chemical Reactions Induced by Nuclear Radiations."

Textile Institute

Manchester: 16 St. Mary's Parsonage, 7.15 p.m. Address by Prof. J. B. Speakman.

FRIDAY, APRIL 7

The Chemical Society

St. Andrews: United College, 5.15 p.m. (with St. Andrews University Chemical Society). Prof. R. D. Haworth: " Developments in the Chemistry of *cyclo*-Heptane Derivatives."

Incorporated Plant Engineers

Birmingham: Imperial Hotel, 7.30 p.m. A.G.M. followed by films " Through the Mill " and " The Tube Age."

Oil and Colour Exhibition

THE London section of the Oil and Colour Chemists' Association is again to organise a technical exhibition at which suppliers to the paper, printing ink and allied industries will present their latest work on materials, plant and apparatus. The exhibition will be held at the Borough Polytechnic, London, S.E.1, and will be open from 3-9 p.m. on April 13 and 14.

Among the exhibitors will be the Paint Research Station, Teddington, which will illustrate the application of modern chemical and physical techniques to paint research problems. Other displays include National Titanium Pigments, Ltd., Shell Chemicals, Ltd., Townson & Mercer, Ltd., British Industrial Solvents, Ltd., and the Geigy Co., Ltd.

LETTER TO THE EDITOR

Toxic Agricultural Chemicals

SIR,—We were very interested to read your article on toxic agricultural chemicals in THE CHEMICAL AGE of March 11 and we were glad to see that you emphasised Dr. Hunter's warning against the promiscuous use of these new compounds by unskilled operatives.

We have made a close study of the toxic properties of these materials and all spraying of them carried out by our Contract Spraying Service is done under the strictest supervision, employing safeguards which go even beyond Dr. Hunter's recommendations.

In your article you make a plea for an " amber " waiting period before these materials are put into wide use. May we suggest that this period could be very well covered by restricting the use of these chemicals to experienced contractors who have an adequate medical and safety organisation.—Yours, etc.,

M. N. GLADSTONE,
General Manager.

Pest Control, Ltd.,
Bourn, Cambridge.

· OVERSEAS ·

Vitamin D Manufacture

The German High-Vacuum Works, Uetersen, Holstein, has recently started to manufacture vitamin D, supplies of which had to be imported after the war.

U.S. Bauxite Production

Domestic mine production of bauxite in the U.S.A. in the last three months of 1949 increased to 323,266 long tons (dried equivalent), according to the U.S. Bureau of Mines. This was the highest quarterly output for the year, but preliminary totals estimated at 1,139,115 tons for the whole year show a decline of 22 per cent on 1948.

Austria's Expanding Chemicals

Production of trisodium phosphate from bone waste from the manufacture of glues is planned by a Vienna firm, while another enterprise in Baden has begun the manufacture of sodium sulphide. Another expansion is the production by the Styrian Chemical Works, Ltd., of flotation chemicals for use in the mining industry.

India's Aluminium Output

A production figure of 3550 tons for the current year has been fixed by the target committee for the aluminium industry. The target, fixed by a meeting recently held in Calcutta, was based on output in 1948 and 1949. Problems of electric power, movement of petroleum coke through Pakistan, and transportation of bauxite may hinder the achievement of this target.

Wider Use of Mathieson Mercury Cell

The Mathieson stationary mercury cell technique is being adopted by the chemical plants division of the Blaw-Knox Company, Pittsburgh, Pennsylvania, in the construction of chlorine and caustic soda plants. Developed by the Mathieson Chemical Corporation, the process permits the economical production of both chlorine and caustic pure enough for direct use in the manufacture of viscose rayon.

University of Technology Opened

Many prominent people attended the laying of the foundation stone of the New South Wales University of Technology at Kensington, near Sydney, on Saturday, February 25. A research professorship in mechanical engineering has been provided by Lord Nuffield. A message pledging his co-operation was received from Prof. M. L. Oliphant, who goes out to Australia next year as director of the Research School in Physics of the Australian National University.

Italy Offers German Chemical Shares

The German participation in the Società Italiana de Litopone—200,000 shares at 50 lire each—is offered for sale at lire 150 million by the Ufficio Beni Alleati e Nemici, Italian Ministry of the Treasury.

Brass for Non-Sparking Tools

The National Corporation Sonderbronze, of Berlin-Oberschöneweide, at the Leipzig Fair will exhibit a new type of brass, used for the manufacture of non-sparking tools. The brass is claimed to be a complete substitute for beryllium.

East German Paint Research Laboratory

The Association of Nationalised Paint and Lacquer Manufacturers in Eastern Germany is to establish this year a research laboratory in Magdeburg. To achieve more economical working, the association, which now embraces 23 units, plans to merge these into a few large concerns.

U.S. Sulphur Output in 1949

Production of native sulphur in U.S.A. in December totalled 392,655 long tons and the output for the year of 4,745,014 long tons was only slightly lower than in the record year of 1948. Producers' stocks were 3,099,305 long tons, a decrease of 125,709 compared with the previous year.

Modified Ethylene Process

A modified process for producing ethylene has been described in the U.S. by R. M. Deansley and C. H. Watkins, both of the Universal Oil Products Company. In producing ethylene from refinery gas for the production of ethylene glycol, air or oxygen is admitted to the catalytic reactors. The heat needed for the reaction is supplied by the combustion of coke formed by the reaction itself. Advantages claimed are better yields of ethylene and the possibility of using impure feed chemicals.

Italian Nicotine Programme

Experiments are being made in Italy in the cultivation of varieties of tobacco plant intended solely for the production of highly concentrated nicotine. A special factory is also planned which will utilise by-products of tobacco for the production of anti-pest products. Italy is the largest tobacco producer in Europe; about 64,500 tons were produced there during the past campaign. At present the crop occupies some 65,000 hectares. Tobacco is a State monopoly in Italy.

SOUTH AFRICAN CHEMICAL ENTERPRISE

Government Interest in Development Schemes

From Our CAPE TOWN CORRESPONDENT

OXYGEN, dissolved acetylene and other compressed gases are now being produced at Germiston by a firm recently established by an international organisation of Canadian origin. Part of this new factory will produce oxygen and part will manufacture dissolved acetylene—the company's two main products. The acetylene factory will use calcium carbide produced in the Union. It is also expected to produce nitrogen, compressed air and oxygen for medical purposes. The company has also acquired a two-acre site at Durban where a similar factory is to be completed, and is expected to start production during this year. The factories concerned will be fully mechanised and will provide employment for some 100 people.

* * *

Lining of tanks, containers and filter presses with a protective coating against chemical attack is now being undertaken by a firm recently established in Johannesburg. The lining is basically a synthetic resinous material of the phenol formaldehyde group and is applied by a special stoving process at a relatively low temperature. It is claimed that the lining, which has a high gloss, is durable, tough, chemically inert, non-tainting and completely sterile.

* * *

Export of South African fishmeal in excess of local requirements was recently officially approved. Production varies, and last season output was only sufficient to meet local needs. There is, however, said to be a ready market overseas for any surplus, particularly in California.

* * *

A rebate of import duty on the materials needed for the manufacture of synthetic resins has been recommended by the Board of Trade and Industries. By developing the synthetic resin industry the Union hopes to make considerable savings in its foreign exchange requirements.

* * *

In reply to a question in the House of Assembly the Minister of Economic Affairs said that a memorandum had been received from the Board of Trade and Industries on the proposed establishment of a South African oil-refining industry, possibly in Durban. The report, however was not favourable and the Government was not prepared to take steps opposed to the board's advice.

* * *

It was felt that the establishment of such enterprises should be left to private enterprise. Any proposals from private individuals or companies would be considered sympathetically, and provided excessive concessions were not required.

* * *

Satisfactorily successful results are reported to have rewarded attempts to eradicate the tsetse fly which was formerly prevalent over 7000 sq. miles of territory from the Tugela river to Portuguese East Africa. Spraying of benzene hexachloride has proved most effective, particularly in the otherwise inaccessible gullies of the hilly Hluhluwe district.

* * *

The continuance of State interest in a large department of chemical production, the organic products factory at Klipfontein, which is a source of DDT supplies, has been the subject of a good deal of controversy and some alarm by private chemical enterprises in the Union. The factory was operated during the war largely for the production of explosives. Questioned in Parliament whether it was intended to nationalise the factory or to introduce any other legislation to deal with the matter, the Minister of Economic Affairs said the whole position was under consideration.

South African Wattle and Bark

Demand for South African wattle bark and extract during 1949 was so large that exporters had difficulties in meeting the requirements. Exports of extract amounted to approximately 94,800 tons (91,100 in 1948) and 7200 tons were delivered to local tanneries—an increase of 1800 tons more than in 1948. Bark exports, 61,600 tons, were also a little higher than in 1948. Total value of both exports was about £5 millions and the U.K. absorbed about 45 per cent (50 per cent in 1948).

INDIA'S ATTENUATED SOAP INDUSTRY

Aim to Revive Production and Exports

PROPOSALS to rehabilitate the Indian soap industry, to improve its technology and export capacity and to increase the use of indigenous chemicals and oils were discussed by industrial and Government spokesmen at the recent 16th conference of the All India Soap Makers' Association in Madras.

The conference served to reveal how large has been the setback Indian soap makers have experienced since the end of wartime conditions, which had fostered new markets for the Indian soap products.

Mr. Godrej, the association's president, said that the plight of the industry could be gauged from the fact that although installed capacity was 300,000 tons, production in 1948 was 180,000 tons and, in 1949, less than 100,000 tons. The average indigenous consumption was 125,000 tons.

Few Exports

Wartime demands were inflated and the lack of soap in other countries was mainly responsible for the bumper sales during that time. But the cessation of hostilities, followed by the loss of India's rich markets after partition, contributed to the steep decline in demand. There were now no significant exports from India, the president said.

Tracing the history of the industry, Mr. Godrej said that for a long time all the soap consumed in India had been made at home and soap-making was the one industry which supplied all domestic needs and was able to export.

Although over a year had elapsed since the Government's attention was first drawn to the high cost of vegetable oils, by far the most important and indispensable raw material, it was most regrettable, he said, that the prices continued to be considerably higher than those which, for example, manufacturers in the United Kingdom paid for high-grade coconut and palm oil. Yet India was the home of many vegetable oils.

To avoid further hardship to the manufacturers and consumers, the very high duty on coconut and palm oils must be removed and ways found to check speculation in groundnut prices. Self-sufficiency in raw materials should be achieved through greater production of caustic soda and of perfumery materials.

The importance of soap exports in the country's present precarious economy could not be overlooked. The Government should realise that it must foster and strengthen economic contracts through a study of foreign markets by experts.

The industry's aim to reduce costs could be brought about only by maintenance of a certain level of production. They were prepared to take a risk, provided the per capita consumption—only one lb. compared to 20-25 lb. in the western countries—could be raised.

Mr. P. S. Kumaraswami Raja, Chief Minister, who inaugurated the conference, suggested that efforts should be made to replace the edible oils, now being consumed on a large scale for soap-making, by non-edible oils.

The growth of the soap industry in India would create a steady demand for vegetable oils, chemicals and other ingredients, which would involve the development of many subsidiary industries. The use of non-edible oils might render the products of industry much cheaper.

It was high time, he said, that those engaged in soap manufacture took stock of the present position of the industry, and made plans for its improvement.

Mr. P. B. Kurup, chairman of the reception committee, said that the South Indian Soap Makers' Association, which had been functioning as a parallel association to the All India Soap Makers' Association, had now agreed to work with that organisation.

Surplus Stocks

The industry today, he said, was faced with the tragedy of mounting production, stock accumulation and decreasing purchasing power of the masses. Normally the surplus would have found its way to Burma, China and Indonesia, but the political ferment in those areas had virtually closed the door. Pakistan, which had been the main consumer, did not seem now to patronise Indian products. Egypt, the Sudan, Cyprus, Syria, the Lebanon and Ceylon were now fairly advanced in soap-making.

Mr. Kurup considered they had depended too long on foreign essential oils and aromatic perfumes. There were abundant facilities in India for growing all species of aromatic plants and Indian firms had already made a beginning in the manufacture of essential oils and perfumes. The industry, he said, must be nationalised.

The Stock and Chemical Markets

GENERAL undertone in British Funds and industrial shares has been firmer. Success of the new East African loan helped British Funds, and leading industrials were favoured because of attention drawn to the attractive yields and the assumption that in most cases there are excellent prospects of dividends being maintained.

Imperial Chemical have been active around 42s. 4½d., the market continuing to expect excellent results and an unchanged 10 per cent dividend total. Monsanto, however, eased further to 48s. 9d. Laporte Chemicals 5s. shares were 9s. 4½d., Albright & Wilson 28s. 6d., Amber Chemical 2s. shares were 4s. 9d., F. W. Berk 14s. 3d. and Boake Roberts 25s. 6d.

In other directions, Bowman 4s. shares were 5s. 3d. and Brotherton 10s. shares 19s. 3d. Sanitas Trust 10s. shares eased to 16s. 3d., Pest Control 5s. were 7s. 9d., W. J. Bush 5 per cent preference 22s. 3d., and L. B. Holliday 4½ per cent preference 19s. 9d. Fisons rallied to 21s. 9d. on the new issue terms.

Shares of plastics and kindred companies were uncertain, apart from British Xylonite, which changed hands around 67s. 6d. J. B. Broadley 1s. shares fell to 3s. 9d. on the passing of the dividend; Kleemann were 8s. 9d. and De La Rue 21s. 3d.

There has been further buying of United Molasses, which have risen to 40s., partly due to the market view that there are share bonus possibilities. Lever & Unilever have been steadier at 41s. 6d., but Lever N.V. eased further to 40s. 6d. There was again firmness in British Glues (20s. 3d.) because of dividend possibilities, and Amalgamated Metal shares, at 19s., remained under the influence of their increased payment. British Oxygen at 94s. 6d. have been firm, in anticipation of the financial results and helped by the prospect of an issue to shareholders on attractive terms.

Associated Cement strengthened to 77s. and, after an earlier reaction, Borax Consolidated to 52s. 6d. Turner & Newall were firm at 77s. 3d. Glaxo Laboratories, at 45s. 7½d., have been active, and Boots Drug were higher at 46s. United Glass Bottle remained at 68s. 9d., earnings being well in excess of dividend payments; there are good prospects for shareholders. It is not generally expected, however, that there will be an increase in the distribution for the past financial year.

Iron and steels have been firmer, buyers being attracted by the good yields and by the knowledge that, even under nationalisation, there would be prospects of capital appreciation because current market prices are substantially below the " take-over " prices. Hadfields were 26s., Dorman Long 29s. 6d. and United Steel 24s. 6d. Babcock & Wilcox, at 57s. 6d., showed some profit-taking; Staveley firmed up to 75s. 6d.

Oils eased after earlier small gains. Anglo-Iranian were 75/32 and Shell 63s. 1½d.

Market Reports

THE effects of changed values of sulphuric acid, zinc and zinc oxide have represented the main factors in the industrial chemicals market during the past week. The movement to the home consuming industries is on a steady scale and the flow of export inquiry remains satisfactory. In most sections the supply is equal to the demand. The reduction recently revealed in the value of chemical exports in February are not entirely accounted for by the shorter month. Australia continues to be one of the more important overseas customers. Trade in the coal tar products is unaltered, pitch continuing in fair request for home and export. The home price is now quoted 90s. per ton *ex*-works for bulk quantities.

MANCHESTER.—Firm price conditions have been maintained on the Manchester chemical market, although there has been little actual movement of stock. There has been a steady flow of delivery specifications from the leading industrial users, representing good quantities of alkalis as well as potash and ammonia compounds. A fair volume of new business on both home and export account is reported. There is a steady call for fertilisers.

GLASGOW. — Business in the Scottish heavy chemical market has been consistent, and the export market is reported to have shown renewed activity.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

EDWARD O'KEEFE, LTD., Dublin, manure manufacturers. (M., 1/4/50.) February 24, deb. securing all moneys due or to become due to the Provincial Bank of Ireland, Ltd.; general charge and a specific charge. *£6000. December 28, 1948.

SOLIDOL CHEMICAL, LTD., London, S.E. (M., 1/4/50.) March 1, £1500 (not ex.) mort., to Lloyds Bank, Ltd.; charged on Ashmead House, Disney Street, S.E.1. *Nil. December 29, 1949.

SOUTHERN CHEMICALS, LTD., Dublin. (M., 1/4/50.) February 27, deb. securing all moneys due or to become due to the Bank or Ireland; general charge and a specific charge upon property in Co. Limerick. *£1000. March 26, 1948.

Creditors' Meeting

DURALITE, LTD., 3 Grays Inn Place, London, W.C.1. A meeting of creditors is to be called at Winchester House, London Wall, E.C.2, on April 17.

Company News

Anchor Chemical Company

Trading profit of the Anchor Chemical Co., Ltd., for the year was £84,401 (including a profit of £14,679 of an exceptional nature). Disposable balance amounted to £86,171. The directors recommended that £20,000 be placed to building and research reserve and a final dividend of 26⅔ per cent (£9900) paid on ordinary shares (40 per cent for the year).

Evans Medical Supplies, Ltd.

The Treasury's consent has been obtained to issue, on behalf of Evans Medical Supplies, Ltd., 615,682 5s. ordinary shares at 5s. 6d. per share for subscription by ordinary stockholders. It is hoped to maintain the ordinary dividend at 10 per cent *p.a.* on the increased ordinary capital and to pay the usual interim dividend of 3 per cent in December, 1950.

London Aluminium Company

The fall in 1949 trading profits of the London Aluminium Co., Ltd., from £303,045 the previous year to £149,464, was explained by Mr. Duncan Campbell (chairman) as being due to the general rise in distribution and production costs, the increased cost of raw materials, particularly aluminium, keener competition in the home market for culinary utensils in aluminium and to the expansion of the company's heavy engineering activities.

Increased Capital

Notification of an increase of the capital of Trimpell, Ltd., petroleum refiners, London, E.C.3, by £499,700 (the registered capital was £300) records that shares were allotted on February 10 to Shell Refining and Marketing Co., Ltd., and to I.C.I., Ltd. The former holds 249,850 "A" shares and I.C.I. the same number of "B" shares.

New Registrations

M. L. Alkan (Production), Ltd.

Private company. (479,840). Capital £7500. Objects: To take over jointly or in association with M. L. Alkan (Sales), Ltd., the business carried on by M. L. Alkan at Long Drive, Greenford, Middlesex; and to manufacture chemicals of all kinds, etc. Directors: M. L. Alkan and K. Alkan, both of 14 Courtleigh Bridge Lane, N.W.11.

Ellis Research & Testing Laboratories, Ltd.

Private company. (479,385). Capital £2000. To conduct research laboratories and other establishments and general, chemical, physical and other scientific investigations and analysis, etc. Directors: E. H. Ellis and M. M. Ellis. Reg. office: Ling House, Dominion Street, E.C.2.

Ellis Scientific Equipment, Ltd.

Private company. (479,386). Capital £8000. Manufacturers of scientific equipment and apparatus, etc. Other particulars similar to Ellis Research & Testing Laboratories, Ltd.

ASSISTING THE PATENTEE

Possible Extensions of Protection

SOME improvements in conditions favouring the patentee are to be noted, in addition to the main provisions of the Patents Act, 1949, which became operative on January 1. Two new conditions contribute to extend the possible fruitful life of a patent.

The period of operation of a patent—ordinarily 16 years—will be increased by the provision that it should now date from the time when the complete specification is filed, instead of from the date of application (12-15 months earlier). A " provisional specification " is required with the application and, if a question of priority should arise, the date of presenting this will be applicable to the case.

The new dating procedure will also allow deferment of payment of increased fees.

Extensions beyond the ordinary term of 16 years are obtainable if it is proved that the patentee has not been adequately rewarded by the patent or that the war has prevented the patent being properly worked. The fact that an extension has been obtained under the " war losses " provision does not preclude an extension under ordinary provision. A sole licensee can now apply for extension of a patent.

No patent has full legal sanction until it is sealed with the seal of the Patent Office and a request for this must normally be made within 21 months from the date of application. Now, even if this time has expired, the Comptroller can order a patent to be sealed, provided a request is made within six months and it is shown that the failure to apply for sealing was unintentional.

German Patent Law

DISPOSSESSION of an enterprise in the Eastern Zone of Germany is applicable locally only insofar as patent rights are concerned; such action does not apply to the territory of the Federal German Republic or to Western Berlin.

That judgment was given recently by the County Court of West Berlin, which further stated that where a company which has been dispossessed in the Eastern Zone continues its activities in the Western zones, protection of its patent rights are maintained.

Products manufactured according to such patents by the company in the Eastern Zone must not, however, be sold, distributed, or used in the Western zones or in Western Berlin.

TAXATION BURDEN

NUM Demands Several Reliefs

THE National Union of Manufacturers, representing more than 5000 firms and 65 trade associations, has sent to the Chancellor of the Exchequer a memorandum calling for " heroic " measures to reduce Government expenditure, including the appointment of an independent body to overhaul Government spending, the reduction of the purchase tax to a flat rate of 33⅓ per cent and a consideration of the damaging effect of death duties on medium and smaller firms and family businesses.

The memorandum emphasises "that the enormous volume of Government expenditure, now absorbing something like 40 per cent of the national income, imposes a crippling burden of taxation on British industry."

The National Union says it can find no justification for the tax on undistributed profits, which can only be regarded as a tax on capital, as it results in reducing the sum that would otherwise be left for capital development. It strongly urges that it should be repealed. It is also recommended that the existing maximum allowance of £2500 as the chargeable remuneration of working directors (in cases where the directors have a controlling interest) should be increased to £5000, retaining the present overriding maximum of 15 per cent of the profits.

Unfair Limitation of Dividends

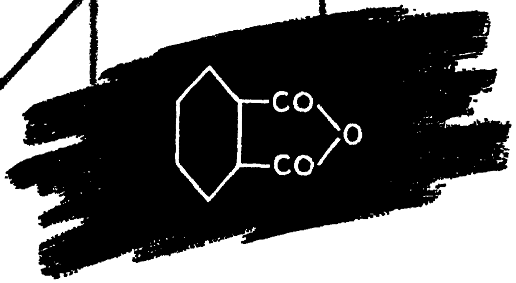
THE need for greater incentives and rewards for the individual worker and producer were emphasised by Viscount Hinchingbrooke, M.P., at a luncheon of the Society of Individualists in London last week.

Referring to the dividend limitation, Lord Hinchingbrooke suggested a partial freeing of payments and declared that there should not be artificial limitation of the dividends of those who had the most interest in the concern.

Encouragement was owed to workpeople engaged in the business, the directors and executives who managed it, the merchant banker who nursed it and the family which founded it—in fact, all who gave a business drive and enterprise.

Lady Benn, explaining the absence through illness of the society's president, Sir Ernest Benn, said that he was very much better and looking forward to attending the next luncheon of the society.

PHTHALIC ANHYDRIDE FLAKES



Phthalic Anhydride is one of two hundred chemicals made by Monsanto and used throughout the field of industry. While the overall production position is a little easier, demand still exceeds supply in many instances

Please write to the Sales Department, indicating the industries in which you are interested, and asking for descriptive leaflets, with notes on current availability

MONSANTO CHEMICALS LIMITED, VICTORIA STATION HOUSE, LONDON, S.W.1

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Preparation of 2-halo-2-formylethanes.—American Cyanamid Co. July 30 1947. 636,353.

Aluminium magnesium alloys.—Acme Aluminum Alloys, Inc. July 31 1947. 636,414.

Manufacture of plastic articles.—B.X. Plastics, Ltd., P. G. T. Hand, J. F. Clark, and A. E. Judd. July 19 1948. 636,233.

Method of concentrating minerals.—Nassau Smelting & Refining Co. Aug. 7 1947. 636,356.

Synthetic rubber-like materials.—B. F. Goodrich Co. Aug. 21 1947. 636,238.

Adhesive compositions.—I.C.I., Ltd., and B. J. Balfe. Sept. 10 1948. 636,423.

Process for absorbing, volatile hydrocarbons from mixed gases.—N.V. De Bataafsche Petroleum Maatschappij. Nov. 4 1947. 636,279.

Production of synthetic lubricating oil.—Standard Oil Development Co. Nov. 5 1947. 636,372.

Production of polymeric esters.—Courtaulds, Ltd., E. R. Wallsgrove, and F. Reeder. Nov. 30 1948. 636,429.

Process for treating olefinic aldehydes.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 16 1947. 636,430.

Preparation of keto-carboxylic acids and their derivatives.—United States Rubber Co. Dec. 19 1947. 636,287.

Paraffin wax composition.—Standard Oil Development Co. Jan. 19 1948. 636,435.

Anodic oxidation of aluminium and its alloys.—Roval, Ltd., S. T. Roberts, and R. W. Taylor. Jan. 19 1949. 636,293.

Manufacture of cyclo-alkadienes.—Standard Oil Development Co. April 29 1948. 636.308.

Method of regenerating a duplex ion exchanger.—Sun Chemical Corporation. Nov. 5 1945. 636,240.

Lubricating oil compositions.—E. P. Newton. (Standard Oil Co. of California). Oct. 18 1944. 636,941.

Process of producing an aqueous dispersion for treating fibrous materials and the treatment of such materials therewith.—Monsanto Chemical Co. June 4 1946. 636,878.

Process of and apparatus for the production of nitric acid.—H. Frischer. March 11 1947. 636,951.

Production of combustible gases from hydrocarbon oils.—Gas Light & Co., S. Pexton, and M. Maccormac. April 14 1948. 637,108.

Castor oil polybasic ester gels.—British Thomson-Houston Co., Ltd. April 18 1947. 637,110.

Processes of improving the stability of an unstable solution of a reaction product of melamine, an aldehyde and a bisulphite.—Monsanto Chemical Co. April 22 1947. 636,892.

Method of producing silica fibres and fibrous articles produced thereby.—H. I. Thompson Co. April 24 1947. 636,893.

Phosphatic fertilisers.—A. R. Standaert, and E. H. I. Brown. May 4 1948. 636,898.

Lustrous zinc and method for production thereof.—Poor & Co. May 28 1947. 636,954.

Manufacture of organosilicon resins.—Dow Corning Corporation. July 3 1947. 636,905.

Luminescent zinc fluoride and method of preparing same.—Sylvania Electric Products, Inc. July 22 1947. 637,120.

Production of pyrazine.—American Cyanamid Co. Aug. 5 1947. 636,918.

Process for the manufacture of phosphoric acid.—Davison Chemical Corporation. Aug. 11 1947. 636,964.

Process for the manufacture of pyridine compounds.—Roche Products, Ltd. Sept. 20 1947. 637,130.

Production of alkali cellulose and cellulose derivatives made therefrom.—M. H. Wilcox, J. Downing, and J. G. N. Drewitt. Oct. 15 1948. 637,133.

Manufacture of cellulose ethers.—M. H. Wilcox, J. Downing, and J. G. N. Drewitt. Oct. 15 1948. 637,134.

Manufacture of sulphur-bearing alcohols.—C. Arnold. (Standard Oil Development Co.). March 27 1946. 637,295.

Manufacture of hard sintered alloys.—Soc. Le Carbone-Lorraine. July 19 1946. 637,165.

Production of strontium peroxide.—A. Pavlik. Jan. 28 1947. 637,172.

Manufacture of catalytic materials.—C. Arnold. (Standard Oil Development Co.). Feb. 14 1947. 637,178.

Modified lead sulphate pigments and the process of manufacturing.—National Lead Co. March 12 1947. 637.304.

Process for preparing mercapto vinyl derivatives.—Gevaert Photo-Producten N.V. March 21 1947. 637,182.

Manufacture of penicillin derivatives.—Merck & Co., Inc. April 11 1947. 637,184.

FORECAST FOR 1950

Sulphuric Acid and Metals

THE rising trend anticipated in chemical production is shown by more than one forecast in the Government Economic Survey for 1950 (CMD 7915). Use of labour by chemical and allied trades is expected to have risen at the end of this year to 455,000 (449,000 in December last).

The expected scale of consumption of materials includes these items:—

	1948	1949	1950
	(Thousand tons)		
Sulphuric acid	1563	1677	1800
Aluminium	174	179	180
Copper	357	319	330
Tin	25	21	22
Refined lead	179	152	200
Zinc	223	199	220

Sterling Aluminium

THE suitability of the Volta river project in the Gold Coast as a sterling area source of aluminium was raised in the House of Commons by Mr. John Grimston. Mr. J. Griffiths said that a survey of the region was in progress, covering not only the possibility of hydro-electric power but also requirements of irrigation and navigation. He would expedite the report.

SPAIN'S METAL PROBLEMS

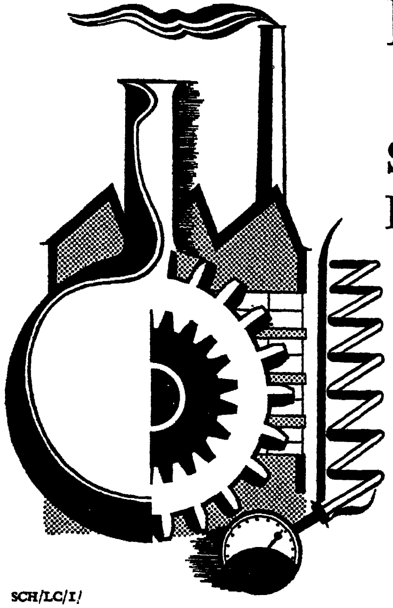
Shortage of Ores and Coal

THE iron and steel industry in Spain, concentrated mainly in the Bilbao district on the Bay of Biscay coast, is facing the likelihood of the exhaustion of the higher-grade ores in the north. That is the conclusion made by the (Canadian) International Trade Relations Division and expressed in an article published in *Foreign Trade* (7, No. 164, 291-4).

There are substantial ore reserves in the south of Spain, but high transport costs make their utilisation uneconomic, the division reports. Plans to produce more steel in the Asturias, using low-grade ores, would take at least four years to become fully effective.

The production of tinplate has fallen in recent years to some 22,000 tons a year, about half the total capacity.

Aluminium consumption is about 3000 tons a year, 2000 tons of which is imported, the balance being produced in Spain from imported alumina. The new I.N.I. plant for the electrolysis of alumina in Valladolid is expected to have a capacity of 10,000 tons a year. The manufacture of alumina itself from imported bauxite is also planned.



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Further particulars may be obtained from the HIGH COMMISSIONER for Ceylon in London, 25, Grosvenor Square, W.1.

Applications for the above post should reach the High Commissioner for Ceylon in London, on or before April 22nd, 1950.

CHEMICAL ENGINEERS required for Bahrein Petroleum Company Limited. Applicants must possess a degree in Chemical Engineering, or have obtained at least a Graduate Membership of the Institution. Experience in petroleum refinery work desirable, but experience with coal tar or other heavy industrial porcesses acceptable. Married applicants must be prepared to accept a two years separation from family. Free board, air conditioned accommodation and medical attention provided with provident fund benefits. Kit allowance. Agreement periods 24 to 30 months with paid home leaves. Commencing salary according experience with minimum £660 p.a. for recent University Graduates. Write with full particulars, age qualifications experience etc., to Box 3353 c/o CHARLES BARKER & SONS LTD., 31, Budge Row, London, E.C.4.

SITUATIONS VACANT

ASSISTANT CHEMIST required for work in the Process Development Department of a Firm in the Manchester area engaged in the Manufacture of Organic Chemicals. Should have Degree or equivalent, together with some experience in industry. A knowledge of Chemical Engineering would be an added qualification, but is not essential. The vacancy should appeal to young Graduates who wish to gain experience in a wide and expanding field of the Chemical Industry. Salary is commensurate with age and experience, and applications should be forwarded to Box No. C.A. 2906, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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THE CIVIL SERVICE COMMISSIONERS invite applications for a post of **RADIOCHEMICAL INSPECTOR** on the staff of the Ministry of Health. Candidates must be at least 30 on the 1st January, 1950, and must have a good Honours Degree in Chemistry and substantial research experience. A good knowledge of the properties and chemistry of radio-active substances is essential and familiarity with techniques of estimating traces of radio-active elements desirable. The successful candidate will be required to carry out such estimations and to give advice on matters relating to the control and disposal of radio-active waste products.

Inclusive London salary, £1,050-£1,270 (men), £900-£1,100 (women).

The successful candidate will be stationed in London but will be required to visit other parts of the country.

Further particulars and forms of application from the SECRETARY, Civil Service Commission, Scientific Branch, 7th Floor, Trinidad House, Old Burlington Street, London, W.1, quoting No. 3018. Completed application forms must be returned by 27th April, 1950.
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The Chemical Age

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Volume LXII 8 April 1950 Number 1604

Keeping the Records of Chemistry

THE Chemical Society last week mustered in strength in Edinburgh, where the venerable forebear of all the chemical organisations celebrated its 109th birthday amid surroundings which witnessed some of the earliest approaches to organised study of chemical subjects. The activities of James IV and his alchemist collaborators long ago set a seal on the region, and it still has a congenial air for those devoted to scientific inquiry. That it shares with Glasgow, where concurrently the Royal Institute of Chemistry was renewing acquaintance with the work and views of its northern members and the university.

Not the least important of the results of the Chemical Society's meetings has been the underlining of the debt which present-day chemistry owes to this moderately endowed association (in the financial sense) of more than 8000 chemists for having fostered the presentation of new knowledge of chemistry and made permanent and authoritative records for all who come after. The "Chem Soc" provides, without doubt, the best example there is today of disinterested service to chemistry, divorced even from such respectable incentives as the prestige belonging to those who turn chemical knowledge into industrial advancement or bestow the professional qualifications. It cares for none of these things and its apparent remoteness from matters which more quickly produce tangible results leads to forgetfulness of the fact that without its full and impartial publication some of the chemical knowledge on which new industries are founded would lie sterile in the minds which uncovered it.

The *Journal of the Chemical Society*, one of the principal means by which significant advances in pure chemistry are given permanent record, has undertaken since the war to mitigate one of the handicaps from which enterprise in chemical research has almost always suffered, the difficulty of getting the results published in full before time and events have stripped them of topical interest. Most chemists are human enough to prefer the chance of immediate recognition to the uncertain prospect of a future niche in some pantheon of chemists, which belated publication may still win for them.

At the end of the war, scientific publishing, like a lot of other peaceful activities, was disorganised and overshadowed by six years' arrears. It was then not uncommon for a paper to wait a year—or longer—before being made fully available, in print, to all who might profit by it or further

On Other Pages

Leader:
Keeping the Records of Chemistry 491
Notes and Comments:
Chemists in Scotland . . 493
Library of Technology . . 493
Points of View . . 493
Opportunities in Israel . . 494
Electrodepositors' Symbolic Badge of Office . . 494
British Chemical Plant . . 495
BCPMA Luncheon . . 496
Long-Service Awards . . 497
The Chemical Society's 109th Anniversary . . 498
Graduates in Industry . . 499
America's Dwindling Chemical Imports 500
A Defence of Biochemistry . . 501
The Physical Society Exhibition . . 503
New Construction for Oil and Chemicals . . 504
Resources for Sugar Research . . 505
OVERSEAS CHEMISTRY AND INDUSTRY
West German Chemical Production 508
Polish Work on Catalytic Action . . 509
India to Have 11 State Laboratories 509
Widening Scope of Russian Chemicals 510
Results of Bentonite Research in Italy 512
Non-Ferrous Metal Stocks Increase 522
Radioactivity Congress . . 518
Aluminium Nomenclature . . 522

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

its theme. Frustration of that kind has, of course, been relieved on a number of occasions by the condensed reproduction made in this journal and its contemporaries. That, however, has not generally disposed of the need for the fuller treatment usually offered by the *Journal*. It is now being noted with satisfaction that the Chemical Society is able to give fairly full reproduction of significant papers three to five months after their presentation.

Reducing the familiar time-lag has required an editing and printing programme larger than had ever been attempted. It was not only that the wartime arrears had to be disposed of; the welcome fecundity of individuals and research departments has also provided a phenomenally large flow of new material and the danger that some contribution of fundamental importance might pass unnoticed has been proportionately increased. The Chemical Society's response to that situation has been ungrudging. The *Journal* in 1949 was nearly doubled in size, producing a total of 3900 pages, the great majority of which were to record original research.

The fact that a proportion of this work may have no obvious bearing upon the main stream of chemical industry at the moment is no true indication of what may be its worth to industries of the future. To ensure that it is preserved, the Chemical Society has overspent its normal publishing reserves by a sum believed to be in the region of £9000. That is not a particularly large amount, seen in relation to the large increase since the war of the cost of printing and publishing. As a supplementary charge on the society's finances, however, it is formidable and justifies the president's current appeal for increased help from chemical industries.

A reliable estimate recently pointed to the fact that United Kingdom chemical industries are spending on research more even than their counterparts in the U.S.A., in proportion to the total funds employed by the British and American industries. I.C.I., Ltd., alone devoted £3 million to research in 1948. If all such programmes of chemical research were to set aside for the benefit of the Chemical Society 10s. of every £100 earmarked for their own use, all reasonable expenditure by the society's publishing section would be generously provided for. Such a voluntary levy might in the long run prove as good an investment as any item in the research account.

Notes and Comments

Chemists in Scotland

THE debt chemistry owes to a succession of great figures in the recent and remote history of Scottish teaching and discovery was liberally acknowledged in Glasgow and Edinburgh in the latter half of last week. In Glasgow the tributes were by speakers at the several functions associated with the annual meeting of the Royal Institute of Chemistry, and in Edinburgh on Thursday and Friday leaders and distinguished workers in chemistry and physics provided at the 109th anniversary dinner of the Chemical Society what was, in effect, a symposium concerned with the great figures and historic events which have enriched present-day science and technology. As evidence that the undoubted triumphs wrought by Scottish workers were not unaccompanied by some setbacks, Sir Edward Appleton recalled to members of the Chemical Society that one of the early papers published by the Royal Society of Edinburgh, describing "the conversion of carbon into silicon," was plain nonsense. The profound influence exercised by one outstanding Scot, G. G. Henderson, in broadening the basis of chemical education, especially in its relationship with industry, was emphasised by Dr. W. M. Cumming in the second G. G. Henderson Memorial Lecture to the RIC at the University of Glasgow. Henderson, who devoted 45 years to the Royal Technical College and the university, was shown to have been one of the decisive influences in making clear the interdependence of pure and applied chemistry. Henderson's first paper on instruction in chemical engineering predated by several years the first recognised text book on that subject.

Library of Technology

HENDERSON'S uniquely integrated conception of chemical education continues to confer great benefits on industrial chemistry, as well as shaping the course of tuition at the university, where every student of applied chemistry spends three months studying industrial processes. The great practical value of that is vouched for by Dr. Cumming, whose career and philosophy exhibit a close affinity with those of his brilliant predecessor. An instance of his deep concern with practical needs was his plea for the provision of a first-class library of chemical technology. There was, he pointed out, not one in the length and breadth of Scotland, and he proferred the suggestion, which is not likely to be lightly dismissed, that the provision of comprehensive and authoritative literature, including material on relevant patents, should be a service provided by the Department of Scientific and Industrial Research.

Points of View

THE treatment in the general Press of the chemistry proceedings in Edinburgh was in one regard a reminder of the kind of difficulty to which chemists had better reconcile themselves when they attempt to present in public a balanced account of what the laboratories have done or seek to do. Thus a jocular reference by Sir Ian Heilbron, during the civic luncheon given in honour of the Chemical Society, to the fact that Sir Wallace Akers, the I.C.I. research director, was wearing a suit of which 50 per cent of the fibre came from "the much maligned groundnut" (Ardil) was elevated by several Scottish national papers almost to headline status. To cap the totally unpremeditated celebrity conferred on "groundnut tailoring," three stanzas were provided by "Lucio," the *Manchester Guardian's* witty commentator in verse on current events. "Lucio's" final tribute to this department of applied chemistry was this:—

"So here's to the day when they dig out
New suitings on which we shall pounce,
And man in his jubilant rig-out

Will proudly and firmly announce:
'My attire in one sense may be cheapish,
But you cannot complain of the cut—
Though 50 per cent of me's sheepish,
I'm 50 per cent of a nut!' "

Opportunities in Israel

THE recent release to the new State of Israel of sterling totalling nearly £14 million has more important implications than the bare fact appears generally to have conveyed. Not only does it mark the turning point in what has hitherto been a far from happy relationship, but it calls attention to a circumstance about which there should be no mixed feelings. That is the need to emulate what U.S. exporters, and particularly engineers, have been doing for a long time, by helping to supply the urgent needs of the substantially new market, among which chemical engineering products are prominent. The possibility that this may invigorate competition with United Kingdom chemical industries need not be considered, because any need British engineers fail to supply the Americans certainly will. U.S. industries have not confined themselves to a simple export programme. They are sending tools, plant and technicians and occasionally contracting for finishing processes to be carried out for them in Israel. They are, of course, sending capital too, to support such projects as the emigrant Philco plant which is to make 6000 refrigerators a year in Tel Aviv, programmed to operate this month, and the Ford truck assembly plant at Haifa. The new growth is, fortunately, not entirely of American inspiration; one of the principal new sources of electric motors—up to 25 h.p.—will manufacture under a British licence. The certainty that the £6.44 million which the United Kingdom exported to Israel in 10 months last year is not the best that can be done is suggested by the new sterling credit—even though nearly half of that will be required to replace the oil supplies no longer provided by the Haifa refinery. American-made goods are already being grouped in exhibitions in Tel Aviv, and contracts to assemble and finish are being readily accepted by Israel industrial groups.

Electrodepositors' Symbolic Badge of Office

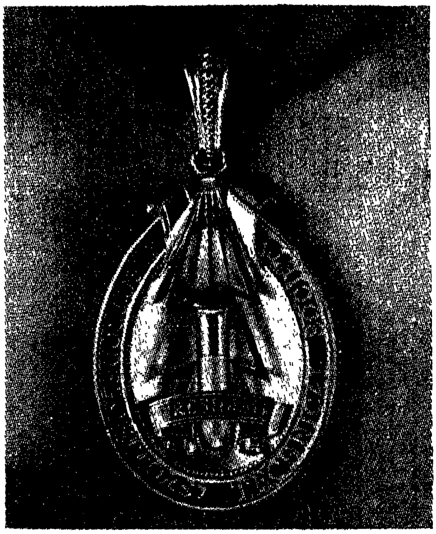
DESIGNED by Mr. Reginald H. Hill, and first presented this year at the investiture of Mr. A. W. Wallbank, the presidential badge of the Electrodepositors' Technical Society is constructed of hall-marked sterling silver.

The pierced outer rim is rhodium plated and the central motive shows a test tube in green enamel and rhodium plate, symbolising the society's concern with chemistry and, in particular, with the green nickel solution. Two lightning flashes depict the connection with electrical knowledge.

The flashes and initials are in bright gilt and appear in sharp relief against a concave back plate finished in frosted gilt.

The title " President " is picked out in green enamel on a gilt scroll and the name of the society is in pierced work, brightly gilded.

The whole badge is suspended from a green ribbon by a gilt fluted loop.



BRITISH CHEMICAL PLANT

Manufacturers' Association's Active Year

A YEAR of considerable activity reflecting the vitality of the association was recorded in the report of the executive committee for 1949 presented at the annual general meeting of the British Chemical Plant Manufacturers' Association held in London last week.

Membership had increased from 101 to 141 concerns, a satisfactory conclusion to a campaign which had been launched at the beginning of the year by the publication of a booklet entitled "The Story of the British Chemical Plant Manufacturers' Association," which set out its scope, activities and service to members.

The association has always been aware of its value as a meeting ground for those concerned with the design, manufacture and supply of chemical plant and, so that such discussions might take place on a broader basis, provision was made in the articles of association for a class of associate membership to include concerns which are specialist suppliers to the chemical plant industry.

Associate Membership

Since the last annual general meeting seventeen such concerns have been elected associate members and represent such important elements of chemical plant as special materials of construction, pumps, valves, instruments, thermal insulation and packing and jointing.

In considering membership policy, the report emphasised that the association must always be founded on chemical engineering and that it attached less importance to numerical strength than to its eventual inclusion of the whole of the true chemical plant industry.

Although some controls had been removed and the problem of raw materials had improved, the need had continued for close consultation with the Government, and relations had remained harmonious.

With the liberalisation of European trade, schedules had been published of equipment which could be imported into the United Kingdom without licence. Gas and chemical plant was included in the list which became operative on January 5, 1950.

It was too early yet to state how competition resulting from this might affect members of the BCPMA, but it had to be remembered that all equipment imported under Open General Licence must carry appropriate import duty if similar equipment was available from U.K. sources.

Steel supplies had improved, but economy was still necessary and the Cabinet sub-committee had expressed its appreciation of the efforts made by the chemical plant industry.

The diverse range of specialist interests of members had presented a number of problems in connection with sending a chemical plant team to the U.S.A. to study American methods. The association was, however, keeping in touch with the U.K. section of the Anglo-American Council on Productivity and the whole question would be reviewed early in 1950.

Standardisation has taken on an increased significance during the year, when so much attention had been focused on efficiency in production. Two reports had been published, the Lemon Committee's for "Standardisation of Engineering Products" and the Anglo-American Council on Productivity's "Simplification." These were now receiving the attention of the executive committee.

During the year, the Board of Trade conducted a written inquiry to ascertain industry's views on the organisation and activities of the British Standards Institution. The Board's questionnaire was given detailed consideration by the BCPMA representatives on the BSI Chemical Engineering Industry Committee, under the chairmanship of Mr. J. Arthur Reavell, and a reply was sent from the association.

Pressure Vessels

In November the British Standards Institution published a provisional code entitled "Fusion-Welded Pressure Vessels for use in the Chemical and Allied Industries." The publication of this code is the result of a number of years of careful study by a committee on which the BCPMA was particularly active and it represents a step forward of fundamental importance to the chemical plant industry.

A Department of Scientific and Industrial Research committee was formed in April under the chairmanship of Mr. H. W. C. Cremer "to review the needs for research in chemical engineering and the extent to which they can be met by existing facilities."

To enable the association to make a constructive contribution to the deliberations of the Cremer Committee, a research committee was appointed to consider the whole question of research as it effects the chemical plant industry and to assemble and correlate the information from members. It emerged that in a number of chemical engineering fields important to the chemical plant industry there is need for research and a comprehensive list of classified problems was submitted to the DSIR for the consideration of the Cremer Committee.

An education committee was appointed to place the views of the association before the chemical engineering sub-committee of Lord Hankey's technical personnel committee of the Ministry of Labour and National Service. Following this a questionnaire was addressed to all members to ascertain the number of people now employed as chemical engineers in the industry and the total requirements in four years' time.

Arrangements had been made to hold a discussion early this year on the "Education and Training of Chemical Engineers."

During the year the association devoted more time and energy than ever before to the promotion of exports to the dollar areas. It has not yet been possible to assess the full implication of the devaluation of sterling. Much will depend upon the extent to which costs finally increase: it is, however, unlikely that chemical plant costs will rise as much as those of goods that have a high dollar import content and the industry should therefore be in a substantially better position than hitherto to export to hard currency countries. But all the sacrifices that are entailed by this devaluation will be in vain unless every section of British industry redoubles its efforts to increase exports to North American and other hard currency countries.

Although the chemical plant industry's total exports cannot be assessed accurately from published statistics, the following figures for exports of "Gas and Chemical Plant" taken from the Trade and Navigation Returns are of interest as giving some indication of the growth of the industry's contribution to the export drive:—1947: £0.99 million; 1948: £2.19 million; 1949: £3.67 million.

The position regarding the holding of a chemical and chemical plant exhibition during the next two years as foreshadowed in the 1948 report has not yet been clarified. This important question will, however, be receiving the close attention of the executive committee during the coming year.

The BCPMA Luncheon

THE spirit of industrial collaboration which prevailed between the British Chemical Plant Manufacturers' Association and Government departments, the Federation of British Industries and the various other bodies and trade organisations with whom they had contact, was referred to appreciatively by Mr. A. G. Grant, the association's chairman, at the annual luncheon in London last week, in proposing the toast of "The Guests."

He gave a warm welcome to the representatives of the Association of British Chemical Manufacturers, because it was their members who gave them orders, and he could not let the occasion pass without expressing their great admiration of the ABCM's "Report on the Chemical Industry," recently published. "In its clarity of writing, its objectivity, and in the feeling of excitement it engendered in the reader, that report was monumental." He asked the association to accept their congratulations on so fine a piece of work.

There was one group of guests they were particularly glad to welcome, and that was the representatives of the Technical Press. To know the Technical Press of other countries was to hold our own in admiration. "We often criticise them," said Mr. Grant, "but we sincerely value their high standards of writing and editorship, and the disciplined good taste which are apparent in their pages. I know all will support me in a word of thanks and appreciation, and also in a reminder to them that they can—with their objective view of our work and industry—do much to help and guide us, not least in those matters of direction and planning which appear more clearly to those who are of our industry but outside it."

Mr. Grant referred in feeling terms to the regretted death some three months ago, of Mr. Norman Neville, which took away from them not only an able director, but one in whose mind lay much imaginative thought as to their forward action.

In looking ahead, Mr. Grant said he saw very clearly the port that they must sail into. It was the greatest possible prosperity deriving from the greatest possible productive success of every one of their member firms. And so their port would be reached by the association in all its works giving service for, and in the best interest of, its members. Their every action must strengthen each chemical plant builder so that in the best sense of private enterprise he could make his maximum contribution to home and export programmes. They must defend him against those interferences, political and otherwise, that made private enterprise so hard. They must take every opportunity with Government and industry to enlarge and free his sphere of activity, and to provide a framework which was at once a guide and a stimulus.

Their problems all really centred now on the one big national dilemma, and that was how, over the years, they were to sell abroad enough goods and manufactures to buy all that this country of 53 million people wanted. That problem must induce the Government, whatever party was in power, to hold a concern for the efficiency and productivity of industry, and particularly of an industry such as theirs. Such a concern was necessary and sane, but unfortunately it might, through dogma and ignorance, express itself in a desire to "manage" them—by ownership or by curiously termed "development councils."

Reconstruction Programme

It seemed to him that their industry had a most encouraging prospect of work ahead. He referred primarily to the part they hoped to play in the continuing chemical industry reconstruction programme, but also to the extensive programmes of the gas, by-product, and petroleum industries, which included much plant of the chemical engineering type. He would like to remind those industries he had mentioned how important BCPMA members, the designers and builders of plant, were to them. Also, if they were to be available and prepared to supply major schemes and difficult plant on infrequent occasions, they must be able to depend on a steady stream at all times of ordinary bread-and-butter orders. In other words, the service they could render depended on their being healthy and prosperous and always able to experiment and develop.

Sir Robert Sinclair, president of the Federation of British Industries, responding to the toast, voiced the widespread sorrow throughout the FBI membership at the death of Mr. Norman Neville, who had made so great a contribution to the work of the British Chemical Plant Manufacturers' Association and, he might most justifiably add, did great service to the cause of organised industry generally.

On behalf of the FBI, Sir Robert Sinclair expressed their best wishes to Dr. Hoblyn, through whom, he had no doubt, the traditions which Mr. Norman Neville founded would be worthily carried on. In the country's national economy much had been achieved in the way of restoration of physical damage caused by the war, and industry had given convincing proof of its enterprise and imagination and technical skill in the field of research and development, and also of a capacity to restore production.

Increased Production

Considering the handicaps under which industry had laboured in the last four years, the increase in total volume of production was by no means discreditable, and although actual achievement was not so clear, there was evidence of a rising trend in productivity, said Sir Robert Sinclair. Moreover, when they saw that their exports, visible and invisible, had come, as they did in the last year, to within something like 5 per cent of balancing imports and overseas expenditure, the picture looked pretty good. When he said that the conditions of the last four years had been difficult, he meant in particular, difficult because of two things, first the running down of industrial capital through the present system of taxation, and the considerable restrictions and controls under which industry had laboured.

Industrial Relationship

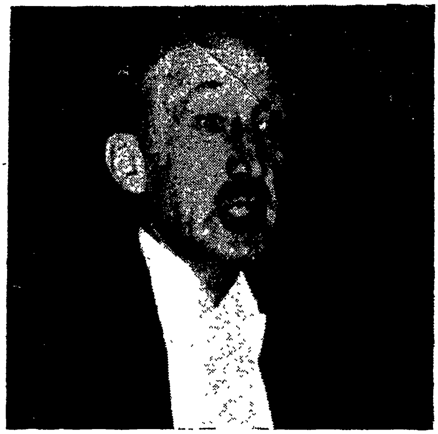
The true relationship between the trade association and the FBI was admirably set out in the booklet "The Story of the BCPMA." Their association had close on 30 years' experience. It must be one of the best organisations of its kind in the country, and it was well that it was so, for there was hardly an industry that in some degree did not use the products made by its members.

Long Service Awards

BROTHERTON & Co., Ltd., which employs about 900 men in its five works, is continuing this year the presentation of long service awards to employees of 25 years' service. Last year, when the awards were instituted, 64 gold wrist watches and 33 bracket clocks were presented to employees with service ranging from 25 to 57 years. This year the chairman will present 13 watches and one clock, among the recipients being Mr. G. Brearley, the present managing director of the company, who had previously been manager of the Mersey works for 18 years.

CHEMICAL SOCIETY'S 109th ANNIVERSARY

Many Chemical Interests United in Edinburgh



Prof. Georg Hevesy, the Chemical Society's guest of honour and Faraday lecturer, conveyed the cordial good wishes on behalf of many overseas scientists for the continued good work of the society

THE cordial appreciation of the achievements and objectives of the Chemical Society was expressed by speakers representing a wide range of interests at a dinner in Edinburgh on March 31, which followed the 109th anniversary meeting of the society. The retiring president, Sir Ian Heilbron, D.S.O., F.R.S., who presided at the dinner, read a letter in which Sir Walter Elliot conveyed his good wishes for the society's work in future and equally warm expressions of goodwill came from Prof. Georg Hevesy, an honorary Fellow of the society and the Faraday medallist for 1950, and the principal officers of other groups in chemistry and chemical industry.

Prof. Hevesy recalled the awe with which he regarded the Chemical Society when he first came to England to serve with the late Prof. Rutherford. He assured them that his later discovery, on meeting members and even members of the society's council, that they, too, were human had not diminished his high respect. Now his hope was that they would continue for many years to fulfil the important duties they had performed in the past.

Dr. C. J. T. Cronshaw, who proposed the health of the guests, called attention to the heightened status and responsibilities of chemical industries, recalling that the presidents of the Royal Society and the Royal Society of Edinburgh were chemists. He believed that the welfare of the country would continue to depend very largely upon the effectiveness of chemical industries and considered it was lucky that the leadership of the society most intimately concerned with chemistry in industry (the Society of Chemical Industry) had the leadership of Mr. Stanley Robson and people of his character.

Superficial Divisions

Mr. Robson, in his response to the toast, recalled the debt owing to the Chemical Society, the oldest chemical society in the world, by the groups which were in effect its offspring, the SCI and the Royal Institute of Chemistry, which safeguarded the professional values. It was sometimes regretted, he said, that their forebears had not been able to create an "umbrella" organisation to comprise all chemists. That ideal, however, was not far from being realised in the fact that work in chemistry was being carried on by different groups in more harmony and friendship than had ever existed between three chemical societies.

While chemists were superficially separated in individual groups, leather trades, chemical engineering, analysts, ceramics, fuel, oil and so on, these were only parts of an indivisible whole. Chemistry overlay them all. No industrial chemist, for example, could be fully equipped without the qualification of knowledge of fundamental chemistry. And no success in chemistry as a whole would be possible if there were not free discussion and exchanges and full library facilities. For those things all chemists had for many years been indebted to the Chemical Society. He felt he could speak for many kindred societies in giving them the wish "That yours may flourish, root and branch, for ever."

The People's Needs

The speaker congratulated the society on having had the distinguished leadership of Sir Ian Heilbron, who had always been mindful in any research he undertook of what would be the effect upon the common needs of the people of this country.

The early distinction which Scotland

enjoyed in promoting chemical investigation was entertainingly recalled by Prof. John Read, F.R.S., in proposing a toast to the City and University of Edinburgh. He called to mind the fact that the first chemical research laboratory of which there was a record was established by James IV in Stirling Castle in about 1500. Prof. Read recalled the many characters of outstanding distinction in discovery and teaching who had contributed the glory which attached to the records of the city and the university.

"Semi-Permeable Membrane"

Responses to the toast were given by Bailie J. B. Stewart Lamb (Senior Magistrate of the City of Edinburgh), who claimed that the furtherance of education had been characteristic of the history of the city for 1000 years, and by Sir Edward Appleton, principal and vice-chancellor of Edinburgh University. Sir Edward Appleton claimed there had been a change in the behaviour of "the semi-permeable membrane" which separated Scotland and England. There was a time when three Scots went South for every Englishman who came to Scotland. Now, he claimed, the exchange had been reversed; it appeared that three Englishmen came North for every Scot who crossed the Border. "That," observed Sir Edward, "is an example of the devaluation of English currency!"

He recalled that earlier prosecution of scientific objectives had not been invariably successful, citing as an example one of the papers presented long ago before the Royal Society of Edinburgh, which published it. This had purported to describe the mechanism by which carbon could be converted into silicon. It was plain nonsense.

The New President

The anniversary dinner ended with the induction by the president of Prof. E. K. Rideal as his successor. The latter, said Sir Ian Heilbron, was well versed in colloid chemistry and his work was known throughout the world. Sir Ian had no doubt that the new president would most ably further the interests of the science which they all loved.

Graduates in Industry

THE usefulness of university graduates in industry was discussed by Professor Patrick D. Ritchie, of the Young Chair of Technical Chemistry, at the Royal Technical College, in Glasgow recently. The difficulty of finding university graduates who could tackle practical problems had been recognised, said the professor, and he confirmed that, in his first job, he too had been of little use to his employers for the first six months. He considered the scheme at the Royal Technical College was the best available. Students of applied chemistry rounded off their courses at the college by dealing with problems in industry and he had been impressed by the co-operation of local industries.

Whale Oil Production in Ireland

An Irish-Norwegian whaling station is to begin operations at Elly Bay on the west coast of Ireland in the summer of next year. The new company to be registered shortly will be called Irish Whaling Company, and the Norwegian Trade Ministry has given permission for equipment to be transferred from Norway.

The new president, Prof. E. K. Rideal, receives the emblem of office from his predecessor, Sir Ian Heilbron. Senior Bailee J. B. Stewart Lamb (seated) represented the City of Edinburgh at the anniversary dinner of the Chemical Society

AMERICA'S DWINDLING CHEMICAL IMPORTS

Can the Decline be Checked?

THE decline of imports of chemicals in the U.S.A. on a scale much greater than that of any other commodity, is the outstanding fact of the latest U.S. returns.

United States imports of chemicals and allied products in 1949 fell to $230,366,000, compared with $276,377,000 the previous year and $323,259,000 in 1947. The full importance of this situation is brought out by comparison with other commodities. In 1949 the value of imports of chemicals and allied products was about 72 per cent above the 1938-39 average, while U.S. total imports of all merchandise increased in value about 200 per cent over the same period.

These facts and the following abstracts are taken from an article by W. R. Koster and Louise Evans, chemical branch, Office of International Trade, U.S. Department of Commerce, in *Foreign Commerce Weekly* (Vol. 38, No. 11).

The data which are reproduced in the table below are limited to chemicals and allied products themselves, and do not include many of the raw materials which the industry uses, such as molasses, chrome ore, and lead. These statistics are, therefore, not a measure of the total volume of imports for which the chemical industry is responsible.

The following are some of the difficulties that impede the flow of foreign chemicals into the U.S.A.

First, as a result of two wars, America has developed a comparative self-sufficiency, and become accustomed to utilising domestic supplies of nearly all chemicals. Chemicals are usually bulk processing materials used for the most part in continuous, mechanised operations requiring a constant and readily available supply.

Since foreign sources are usually located at a considerable distance, U.S. importers are often forced to maintain large stocks in order to provide delivery service equal to that offered by American suppliers.

U.S. products are made not only to meet very high standards of purity, strength, and other specifications, but are usually offered in several grades and varieties of packing, for the buyer's option. Frequently it is difficult to meet these conditions with an imported product.

There is considerable difficulty in discovering what items (especially new items) foreign countries have to offer—or could make—and similar difficulty in discovering which products the United States would buy if they were to be made abroad.

Some of the facts revealed in the table concerning import trade in chemicals and allied products and which have a bearing upon future trends, are:

1. The chemical groups classified as manufactured items represented about 60 per cent of " chemicals and allied products " imports in 1938-39. The relationship went up to 74 per cent in 1943, but was only about 44 per cent in 1948-49.

2. The groups in which the largest import valuations occur are fertilisers, vegetable oils and waxes, and gums and resins.

There would appear to be some justification for an assumption that real effort on the part of foreign countries, particularly European, to increase chemical exports to the United States—not only of the historic commodities, but, over a period of time, specialities and those not now prominent—would result in a reversal of the recent decline.

U.S. IMPORTS OF CHEMICALS AND ALLIED MATERIALS
(In Thousand Dollars)

	Manufactures and Semi-manufactures						Natural Products				
Year	Coal-tar products	Industrial chemicals	Pigments, paints, and varnishes	Fertilisers	Explosives	Sub-total[1]	Gums, resins, and balsams	Drugs, herbs, leaves, roots	Vegetable oils waxes	Miscellaneous[2]	Grand total[3]
1938 ...	15,970	16,794	1,368	36,496	655	78,022	8,563	8,979	20,808	2,151	123,563
1939 ...	18,942	17,631	1,518	32,455	410	79,478	14,338	11,689	24,110	5,053	142,997
1940 ...	9,034	13,334	995	27,201	437	58,245	17,390	15,031	35,872	5,717	139,002
1941 ...	9,384	15,287	846	22,767	1,378	60,712	25,782	14,576	35,291	10,607	158,602
1942 ...	6,441	24,078	571	25,917	27,664	88,792	21,280	12,480	22,852	9,010	166,111
1943 ...	8,174	28,032	307	32,920	126,640	202,637	20,804	12,296	19,110	6,518	272,592
1944 ...	11,433	38,621	1,128	35,453	53,273	155,260	30,041	20,371	32,969	8,766	257,465
1945 ...	11,717	38,516	1,054	41,327	37,703	145,769	27,152	25.406	37,904	10,699	261,681
1946 ...	5,833	38,618	1,349	35,104	1,936	100,043	50,671	32,307	78,150	17,723	295,592
1947 ...	11,387	40,327	1,585	43,453	1,934	112,184	43,340	29,530	103,550	14,152	323,259
1948 ...	18,082	22,490	2,044	56,841	2,617	112,030	39,915	30,085	51,787	16,017	276,377
1949 ...	13,060	17,966	1,424	62,479	1,740	106,256	28,551	25,779	41,727	11,443	230,366

[1] Sub-total includes medicinals, and soap and toilet preparations.

[2] Includes bones, gelatin, glue, casein, beeswax, pyrites, and sulphur.

[3] Total includes medicinals, soap and toilet preparations, and dyeing and tanning extracts—not discussed here.

A DEFENCE OF BIOCHEMISTRY

The Need to Secure Fuller Recognition

by Prof. J. W. COOK, Ph.D., D.Sc., Sc.D.*

THE Council of the Royal Institute of Chemistry has agreed to co-operate with the Chemical Council on a project concerned with publicity for British chemistry. It was reported to the last conference of honorary secretaries that the committee of the Birmingham and Midlands section plans to arrange public lectures by carefully selected speakers, designed to inform the public on the nature of the scientific method and to combat misunderstandings and ignorance about the purpose of science.

We all recognise the need for this and such efforts deserve every encouragement. I am convinced that the Institute should take a much more prominent part in public enlightenment about chemists and their work, and about the achievements of chemistry.

I should like to contrast the public attitude in regard to science in general, and chemistry in particular, with that towards the medical profession. The prestige of the medical profession has never been higher than it is to-day and, as we chemists know well, a great deal of that prestige is due to the achievements of chemical science.

Scant Acknowledgment

The chemists' part in this has received little or no acknowledgment by the public at large, and a somewhat grudging acknowledgment by the doctors themselves. This attitude of the doctors is, I think, due largely to ignorance as to the extent of their debt to their chemical colleagues.

Much is made to-day of the wonders of medical science. By contrast, the popular view of science is that it has become a menace to civilisation. Its practitioners are regarded as half-educated barbarians, completely lacking in any sense of responsibility for the effects of their discoveries.

It is true that a large share of this odium is conferred on physicists, for reasons which are sufficiently obvious, but the chemists have by no means escaped unscathed.

Another aspect of the relationship between the chemical profession and the medical profession concerns the diagnosis, rather than the treatment, of disease. Diagnosis is the major function of the physician, and in exercising this function he is coming increasingly to rely on the evidence furnished by the application of specialised techniques.

The clinical laboratory provides an essential service in the modern hospital, and the pathological, bacteriological and chemical examinations which are made there contribute in a very large measure to the accurate diagnosis of disease.

Chemistry and Diagnosis

As the National Health Service develops, the extent and importance of these ancillary services are likely to increase. Much of this laboratory diagnostic work is purely chemical in character and it is natural, therefore, that the Royal Institute of Chemistry should be concerned with the standards of work carried out, and with the status of those who are engaged on it.

The council has, in fact, devoted considerable attention during the past year to the position of these hospital biochemists under the National Health Service. A joint committee has been set up, consisting of representatives of the Association of Clinical Pathologists, the Biochemical Society and our own institute. This joint committee has drawn up a grading scheme for hospital biochemists and has suggested equivalent biochemical, chemical and medical qualifications which should be accepted as qualifying for admission to the various grades.

Closely allied to status is the question of remuneration. This is, however, a separate issue which is complicated by the fact that a Whitley Council machinery has been set up to deal with salaries.

At this stage the joint committee has suggested scales of salary which would be appropriate to the various grades of hospital biochemist, and I have no doubt that due consideration will be given to these scales. This is all the more likely as I understand that the Ministry has expressed its willingness to accept the joint committee as an advisory body on matters relating to hospital biochemists.

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* Abstract from the presidential address ("Chemistry, Medicine—and Economics") delivered before the Royal Institute of Chemistry at Glasgow University on March 31, by Professor Cook (who also studied at length the outstanding contributions to clinical practice which biochemists have made in recent years).

The name "biochemists" is not a good one, for much of the work of these people is purely chemical and analytical and bears little relationship to what is now understood by the term biochemistry. A much better term would be "clinical chemistry." This seems to be the favoured description in the United States, where in recent months an American Association of Clinical Chemists has been formed. To judge from some recent articles the Americans also are much concerned about the professional status of clinical chemistry, the varying degrees of prestige enjoyed by those engaged in it, and the very variable standards of work.

If I have guessed aright that the work in some of our own hospitals falls short of the standard of accuracy which would be expected of professionally competent chemists, then it is a matter which should concern the institute.

Not for Technicians

Many hospitals have biochemists of considerable eminence and distinction in charge of this work. These are men who have made notable contributions to their subject, and with such organisations there is no cause for misgiving. But at the other end of the scale we may have the chemical or biochemical work entirely carried out by technicians under the nominal supervision of a pathologist who may have no chemical qualification.

In some quarters there has been a tendency to regard analytical work as being unimaginative and routine in nature, and suitably carried out by technicians. This is a very dangerous attitude and one which is perhaps partly responsible for the unfortunate lack of attention given to original work in analytical chemistry in Great Britain.

While many analytical operations may properly be entrusted to trained technicians, this should only be in direct association with a specialist in analytical chemistry who has a broad scientific background such as is implied by the possession of a professional qualification in chemistry.

Another factor which has perhaps been responsible for varying standards of work in hospital laboratories has been the difficulty of recruiting chemists of suitable calibre. This is partly bound up with status and conditions of service, and there is no doubt that in the past these have been strongly deterrent in many cases.

This brings us to the crux of the problem, which is, what should be the relationship between the laboratory worker and the clinician? There are those who hold the view that a hospital biochemist should be medically qualified in order that he should have full access to patients and be able to hold his own with his clinical colleagues.

I have every respect for this view, but it seems to me that it represents an unattainable ideal save in a few exceptional cases. A medical qualification coupled with a smattering of scientific training is liable to produce a third-rate laboratory worker. Most will have to be content with the scientific qualification.

If such men of suitable quality are to be attracted to the hospital service, then they will have to be received on equal terms by the medical staff and they must be deemed eligible for the highest posts. In short, they must rank as scientific specialists and be accorded the same status as medical specialists. It is my conviction that there is no other way in which the hospitals can be assured of a service of clinical chemistry of adequate standard.

The Joint Committee on Hospital Biochemists was set up to deal with some special problems arising out of the establishment of the National Health Service. I hope very much that it may be kept in being and given wider terms of reference. It has been suggested that the institute should establish a new branch in which the Fellowship may be taken by examination—namely, hospital biochemistry, or, as I should prefer to call it, clinical chemistry. I am sure that this would have a beneficial influence on the standard of work in hospital laboratories and I hope that the council will shortly consider this proposal.

Salary Regulation

There is one other aspect of the hospital biochemist situation which I think is of great significance for the Institute, and that is the machinery for determining scales of salary. A series of Whitley Councils has been set up to deal with salaries of the various categories of employees under the National Health Service, and one of these is to deal with biochemists in hospitals as well as a number of other groups of hospital employees. The institute has not been invited to appoint representatives on the staff side of the Whitley Council, nor has it asked to do so.

The Council has been somewhat concerned at the pressure which is being put on chemists to join trade unions, and this applies particularly in the nationalised industries. The trade unions have been built up for the benefit of the manual

(continued on page 504)

THE PHYSICAL SOCIETY EXHIBITION

Government Research Departments' Co-ordinated Display

THE opening day of the Physical Society Exhibition attracted large crowds to the Imperial College in Kensington. University undergraduates and other students were almost as numerous as representatives of industry, and the proportion of new or greatly modified equipment displayed, appeared to justify the wide interest.

The exhibits of eight separate research establishments of the Ministry of Supply were imaginatively arranged and demonstrations by experts added greatly to their value to the viewer.

A type of gamma counting equipment, shown by the Atomic Energy Research Establishment, is suitable for gamma activity measurements where high efficiency counting is essential. Scintillations are observed by an eleven-stage electron multiplier photocell; counting is about 15 per cent efficient for 1 mev gamma quanta, with higher efficiency for lower energies. The noise limit from the photocell corresponds to light flashes from approximately 5 kV electrons and resolution times down to 2 × 10^{-8} sec. can be achieved.

Alpha assay equipment was exhibited, suitable for measuring samples of large area and low activity. An overall efficiency of about 35 per cent is obtained at a background rate of 10-20 counts per hour. Stability is better than 2 per cent.

Sample Collector

A liquid sample collector is used in conjunction with an ion exchange column to separate mixtures of radioactive fission products. It comprises an ion-exchange column; a special GM counter to count the beta particles; a liquid sample collector designed to collect up to 36 samples; a recording ratemeter; and a relay control unit.

The process of ion exchange results in each of the various radioactive products flowing out of the column in turn. Consequently, the ratemeter monitoring the effluent of the column shows an increase in the counting rate as each of the radioactive elements passes the GM counter. This increase activates the control mechanism and a new collecting bottle is brought under the column. Each successive peak of activity gives a signal that a new bottle is required. To guard against any bottle becoming too full, a photoelectric system monitors the position of the meniscus and gives a start signal to the collecting mechanism.

A demonstration by the Chemical Defence Experimental Station attracted a good deal of attention. This showed how homogeneous sprays of small particle size can be produced by an air-driven "spinning top" apparatus. Liquid is fed on to the centre of the top, which can be rotated by the action of compressed air at several thousand revolutions per second, and centrifuged off the edge. At a suitable rate of feed, the spray projected consists of droplets of almost uniform size and a number of fine satellites.

The latter can be removed by suction or other means, ensuring the generation of a homogeneous cloud. Droplets of 10 μ diameter have been produced.

The atomisation of drops of water in a small vertical transparent wind tunnel was demonstrated and could be observed by stroboscopic illumination. Photographs of various stages of the break-up were shown.

A New Pyrometer

The Telecommunications Research Establishment's stand contained some interesting developments, one of which was an infra-red radiation pyrometer, capable of measuring temperatures between 250° and 3000° C, at any distance from the source of heat. The lower limit may be extended by the use of a lead selenide or lead telluride cell. The temperature of cyclically moving bodies can also be measured.

The radiation from the hot body passes through two suitable filters and the filtered beams are interrupted cyclically and 180° C. out of phase, before being combined at the lead sulphide detector. The intensity of one beam is changed by a calibrated variable aperture, until the signal recorded is zero. The position of the aperture then gives a direct measure of the temperature.

A relay, used as a thermostat, is made with a manganese-zinc ferrite. It is claimed to be very robust and unaffected by vibration.

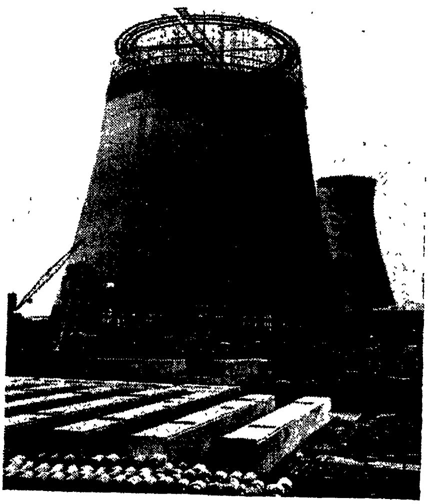
Electronics at Liège Fair

The number of exhibitors of electron and electrical apparatus and the scale of their exhibits have caused the directors of the Liège International Fair to group this class by itself in one large hall.

New Construction for Oil and Chemicals

CONSIDERABLE progress is being made with the building of the new Abrac works at Rainham, Essex, states a report from A. Boake, Roberts & Co., Ltd. The intention is ultimately to transfer the whole of the chemical production from the three factories at Stratford, London, to the 29-acre site at Rainham. This project may take some 10 years to complete.

The first step has been to erect a new plant at Rainham for the production of tri-cresyl phosphate. The existing plant at Stratford, however, will continue in use, while the new one, in about four months, will contribute annually an additional 4000 tons a year of this plasticiser.



An impression of the magnitude of the engineering operations being carried on for the Shell petroleum and chemicals installations at Stanlow, Cheshire, is given by this vast cooling tower (right), now nearing completion. With a height of 340 ft. and girth of 260 ft., it will cool about 5 million gal. per hour

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A DEFENCE OF BIOCHEMISTRY

(*continued from page* 502)

workers and they owe their great power to their numerical strength and to the weapon of the strike.

It would be a delusion to suppose that a relatively small scientific trade union could exercise such power as the numerically large bodies representing industrial workers. It might even in time be swallowed up by one of the larger bodies, and the process of digestion would be painful for the members.

The whole question of protection of economic interests is an exceedingly difficult one. Most of us are painfully aware that during the past 10 years the econmic position of the chemist has steadily declined. This situation is not peculiar to chemists; it has been the common experience of all professional men and women. It is not even restricted to the professions.

It is interesting to note that the levelling-down of incomes has taken place even in such a capitalist country as the United States. A few months ago it was pointed out that, whereas in 1929 the earnings of the American college graduate averaged about 30 per cent more than those of the high school graduate, the difference is now only about 10 per cent.

In our own country, it has been estimated that an income of £440 per annum, in 1938, had the same purchasing power as £1060, in 1948. The post which carried a salary of £440 in 1938 has certainly not been upgraded to this extent.

Another disquieting factor is the modern tendency to standardise scales of salary and to discourage initiative. A man is appointed to a post and can expect to receive a rate of remuneration based largely on his age, and to receive regular increments until he reaches the maximum of the grade. Administratively, this has many advantages and it evades the difficult task of assessing worth.

It is a consequence of the increasing bureaucratic character of our economic system. But I doubt very much whether a system in which merit and industry go unrewarded and inefficiency and sloth unpunished is in the best interests of the community at large.

The time is coming when all these encroachments on the middle-class way of life will have to be resisted. How this can be done effectively is by no means clear. But the situation is one which calls for increasing vigilance on the part of profesional institutions such as ours.

Possibly some measure of co-operation between all the professional institutions will be required, and I think that it is not without significance that the Joint Council of Professional Scientists has recently been reconstituted and can look forward to a new lease of life.

RESOURCES OF SUGAR RESEARCH

Programme and Equipment for Better Refining

by A. G. THOMSON

SUGAR refining is more chemical engineering than a chemical industry, although the processes employed in the separation of pure sugar from the impurities associated with the raw materials are essentially chemical.

These impurities consist mainly of invert or reducing sugars, which are difficult to crystallise and cause stickiness in the sugar; " ash " or inorganic matter; and organic non-sugars, which include organic salts, colloidal gums and waxes, and colouring matter. Raw sugar may also contain sugar lice and generally various forms of micro-organisms. It well deserves all the attention it receives from food chemists; the white sugar produced by modern refining processes has a purity of over 99.9 per cent and is the purest food commercially available.

The principles of sugar refining are fairly simple. The raw sugar is conveyed to the affination station, where it is mingled with raw syrup from a previous batch to produce a fluid magma of crystals and syrup. This magma is fed to centrifugal machines for the affination process. The next operation is the so-called " melting," actually the dissolving of the affined sugar in hot water until a predetermined concentration has been obtained.

Removing Impurities

After being strained to remove coarse, insoluble matter, the sugar-water mixture is pumped to carbonation tanks and treated with milk of lime and carbon dioxide gas. The carbonate of lime precipitate and adsorbed impurities are removed by leaf pressure filters, leaving a brown liquor. This is decolorised and further purified by being passed through cisterns filled with small granular bone charcoal. The water-white fine liquor thus obtained is drawn into vacuum pans for concentration and crystallisation.

The mixture of mother syrup and crystals is dropped from the vacuum pans into holding tanks feeding centrifugals, which spin off the mother syrup, the last traces of which are removed by jets of hot water. The sugar discharged from the centrifugals is conveyed to granulators (rotary drum dryers) to remove the remaining 1 per cent or less of water, and is riddled to separate out the crystal sizes and bagged or filled into cartons.

All these operations depend on chemical engineering methods, and it is very largely because much time, money and research have been devoted to improve them that sugar remains a cheap commodity.

Process Control

Dealing with large quantities, a uniformly high standard of product can only be achieved by a very rigid system of control. At all Tate & Lyle refineries chemists are continuously on duty throughout the 24 hours, testing the materials in process, controlling the manufacturing operations, and ensuring the purity standards of the finished products. In addition to the testing of process materials, the chemists have also to test the many other requirements of the refinery, such as coal, bone charcoal, and the boiler feed water for the high-pressure boilers.

The high standard of production efficiency achieved by existing refineries, most of it derived from research, is the main deterrent to further competition in this field. It is in that sense alone that British sugar refining is " a monopoly," and it is this high standard of technical efficiency that enables British refineries to produce sugar of unequalled purity and cheapness.

Some 10 years ago Tate & Lyle, Ltd., established a research laboratory to centralise research for their refineries in London and Liverpool. This establishment was transferred at the end of 1947 to a large country house at Keston, Kent, providing a floor-space of 10,000 sq. ft., for the company's very large programme of research. The mansion accommodates well equipped laboratories, workshops and offices and, well sited in a 40-acre estate, provides exceptionally pleasant conditions for the research staffs. The low cost and high speed of conversion were an interesting indication of what can be achieved, in spite of the familiar effects of official controls.

The main building consists of a basement, ground floor, and three others. The basement contains a 200,000 BThU Aero-Pannier central heating boiler, a central switchboard, large coal and chemical stores, a carpenter's shop and a store for metal plate, rod and tube. On the ground floor are the general office, conference room and research director's office, as well as a technical laboratory equipped with an electric steam boiler, a water-jacketed plate-and-frame press, and other small plant for the study of refinery process operations.

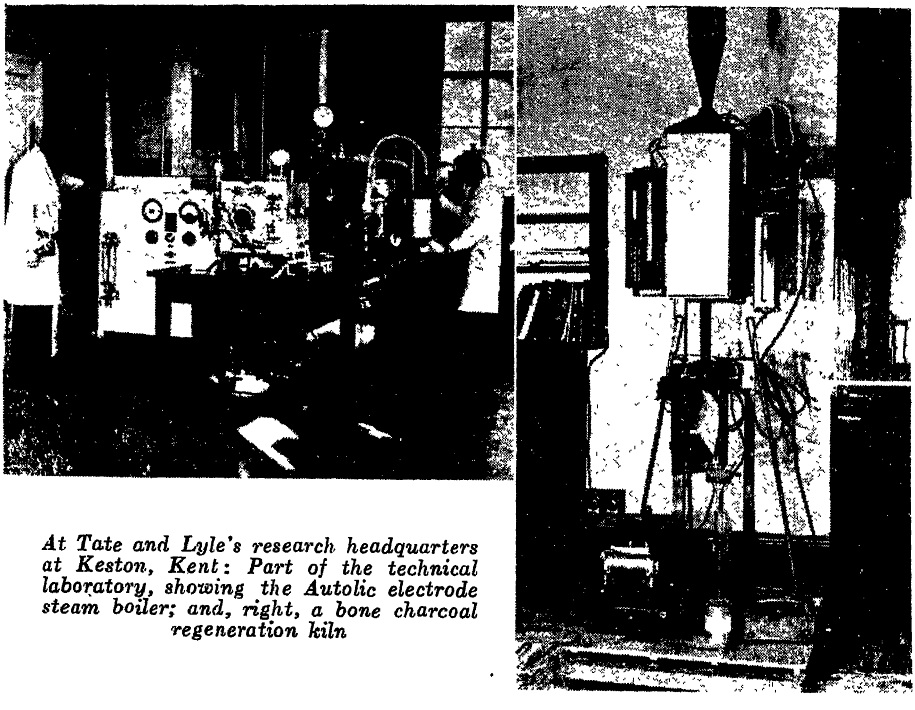
A large ballroom has been converted to house a very comprehensive reference library on sugar technology, chemistry and other sciences, as well as the scientific and sugar journals from all over the world. The librarian is also the editor of the monthly *Sugar Industry Abstracts*, which has a world-wide coverage. A steady flow of foreign currency, including dollars, has resulted from this venture, which is backed by the British Sugar Refiners' Association and the British Sugar Corporation.

Also on the ground floor are well equipped mechanical workshops where special instruments and equipment are constructed, in the production of which extensive use is made of the slotted alloys and steels manufactured by Dexion, Ltd., and G. A. Harvey & Co., Ltd.

The first floor is occupied mainly by analytical and physics laboratories and one of the microbiological laboratories. A second microbiological laboratory on the next floor is used mainly for the preparation of media. The second floor also contains a dark room for a Hilger quartz spectograph and photo-micrographic apparatus, a general photographic laboratory, and a glass-blower's department. On the top floor is a further laboratory devoted entirely to partition chromatography. The detection and estimation of very small amounts of raffinne(?) in raw beet sugars have been demonstrated here for the first time.

The conversion of a fine old country house into a modern research station has been accomplished without disfiguring the building or altering its essential character. The drainage from laboratory sinks has been carried through chemical lead pipes, usually above floor level, to the main drainage system, and all outlets from the main walls have been so planned as to avoid disfiguring the exterior of the building.

In an outbuilding, a diesel electric generator supplies all current during working hours. Fluorescent lighting has been provided in most departments. Compressed air is supplied to the basement technical laboratory and workshop from two air pumps, the intake of one of which serves for vacuum services. The other



At Tate and Lyle's research headquarters at Keston, Kent: Part of the technical laboratory, showing the Autolic electrode steam boiler; and, right, a bone charcoal regeneration kiln laboratories are equipped with portable vacuum pumps.

The research programme is intimately concerned with sugar loss, during refining, which ranges from 0.3-0.5 per cent of the raw sugar melted. This wastage is in all probability the result of a large number of small losses which cannot easily be identified. Some are due to physical causes such as destruction by heat, others are of a chemical or microbiological nature.

Mild steel is extensively used in the construction of sugar refining equipment, in spite of its susceptibility to corrosion, the source of considerable capital loss, and the fact that it is not ideal from the standpoint of possible contamination of the refining product. The additional cost of stainless steel is regarded as uneconomic, in view of the improvements in equipment and processes which are constantly being introduced. Attention is therefore being devoted to the protection of mild steel, as well as to the possible substitution of other resistant metals or plastics.

In order to simulate the type of corrosion occurring in tanks, etc., where the liquor is continually filling and emptying, an apparatus has been developed in which various aluminium alloys are tested by alternate immersion in heated brown sugar liquor. Another experiment is being conducted in a corrosion test tank in which metals and alloys are exposed at a constant temperature of 60°C. both in sugar liquor and in the vapour space.

Galvanic Corrosion Testing

The test equipment includes a small apparatus for galvanic corrosion testing, based on measurement of the emf produced between aluminium and stainless steel immersed in sugar solutions and connected externally.

Research into the protection of mild steel involves the testing of paints, which are applied to sample pieces and exposed to the corrosive conditions of refining processes. Difficulty is being experienced in finding a paint capable of withstanding both sugar liquors and steaming-out temperatures. Plant corrosion tests are also carried out in the refineries, the results being correlated with those obtained in the laboratory.

Each refinery has a large number of char cisterns, each containing about 40 tons of bone charcoal, which has to be regenerated at intervals by heating. Methods of regeneration to obtain optimum conditions occupy a fairly important position in the research and work is also being carried out on the particle size of bone charcoal and its effect on the time required for decolorisation.

Very large economies in plant, maintenance and fuel consumption are expected to result from this work. The company's engineers are awaiting the final results before planning the new bone charcoal departments which are required in several refineries.

The microbiological department is studying the effect of the organisms found in raw sugar,s which are regarded as a possible cause of sugar loss during storage or in the refining processes. Attention is also being given to the freedom of refined products from organisms capable of causing spoilage in foodstuffs in which they are incorporated. A collection of type organisms found in the sugar industry is being made for reference purposes.

Bulk Storage

The physical department is investigating the particle size of icing sugar. Compression tests on sugars are being undertaken to obtain information required for the construction of bulk storage silos, to be erected at the Plaistow Refinery. Another interesting investigation comprises the spectrophotometric examination of colouring matter to obtain more positive data on the characteristics of the many coloured compounds involved and so facilitate the refining processes.

Paper chromatography, the analyst's new tool, is proving most successful in solving many problems arising in the sugar industry, which were formerly regarded as difficult, if not insoluble. The separation of the heat destruction products of sugar and of other sugar constituents, although still in its early stages, holds considerable promise for the future.

Methods of analysis are being studied in conjunction with the refinery chemists, and in that connection a contribution was recently made to the International Commission for Uniform Methods of Sugar Analysis. (Brussels, August, 1949.)

(Cordial acknowledgment is due to Tate & Lyle, Ltd., for permission to visit the laboratories at "Ravensbourne" and to the director of research, Mr. H. C. S. de Whalley, M.I.Chem.E., F.R.I.C., for the information on which this article is based.)

Students Visit Laboratories

A party of overseas students, chemistry students from the Royal Holloway College, and pharmacy students from Bristol College of Technology have been among recent visitors to be shown the plant at Glaxo Laboratories, Ltd., Greenford, Middlesex.

OVERSEAS CHEMISTRY AND INDUSTRY

West German Chemical Production

New High Records in Oil and Potash

WEST German chemical manufacturers have derived some benefit from the slight fall of unemployment and returning confidence in consumer industries as well as the seasonal increase in demand, especially for fertilisers. The long-term outlook is, however, still viewed with misgivings.

During the past year some of the most important chemicals-consuming industries have been among those trades which recorded heavy production gains. Output increases in January this year, compared with January 1948, were most marked in oil refining (78 per cent), paper production (40 per cent) and crude oil production (36 per cent), less so in rayon production (25 per cent) and potash and salt production (24 per cent), and still less pronounced in coal derivatives (14 per cent) and chemicals (12 per cent).

Aid for Engineering

It appears that construction and engineering industries which require comparatively small supplies of chemical products are likely collectively to become more important.

The petroleum refineries continued to make good progress in the early months of 1950. In February their output amounted to 85,000 tons of refined products, while the West German crude oil output was 80,500 tons. The Gelsenberg Benzin plant, which on February 16 received Allied permission to resume operations for the treatment of crude petroleum and oil residues, is expected to be back in commission by May. It may deal with 15,000 tons of residues monthly, and will be free to refine as much crude as is necessary for that.

Gelsenberg Benzin will be allowed to supply hydrogenation gas to Chemische Werke Huels and to deal with the by-product sulphur and ammonium sulphate. Deutsche Vacuum Oel-AG has joined in the search for oil and is now drilling a well near Schaumburg.

The accumulation of substantial stocks of fertilisers enabled permission to be granted at the middle of March for exports of 50,000 tons of nitrogen, 20,000 tons of phosphates and 250,000 tons of potash from the Federal Republic. Potash exports in January reached a new post-war high level and the production in Lower Saxony amounted to 373,738 tons, compared with the 1949 monthly average of just under 300,000 tons. The principal foreign buyers were Japan, Great Britain, Denmark, Belgium, Sweden, U.S.A. and Cuba. The big purchases by Japan have aroused special interest because it was feared that this market might have been monopolised by U.S. producers.

The German potash companies are showing marked enterprise in hastening rehabilitation work. New haulage gear has been installed at the Riedel works, and new processing equipment will be operating in a few weeks at Sigmundshall, where crude salts only are at present being produced. Rehabilitation work is proceeding at Königshall-Hindenburg and Glückauf-Sarstedt. A large consignment of ammonium nitrate is being sent to Holland by Ruhrchemie AG, Oberhausen-Holten.

Although the restrictions on the industrial utilisation of research in the field of carbon chemistry remain in force, the Allied authorities have been very accommodating in dealing with applications for research permits in this sphere, states Prof. Dr. Karl Ziegler, of the Max Planck Institute for Coal Research at Mülheim-Ruhr.

German research was therefore not hampered directly, but it is claimed that the ban on industrial utilisation of the results of such research impaired the research workers' initiative.

Prof. Ziegler also complains about the inadequate equipment of most German research laboratories, and suggests that part of the funds now being made available for productive unemployment relief might with advantage be used for rebuilding university institutes.

New Industrial Mask

A new mask developed for use by miners as protection against silicosis has been exhibited at the Maison de La Chimie in Paris. The Airex mask consists of aluminium edged with very supple rubber. The filtering device uses a cellulose material covered with a filtering tissue and is fitted with an outflow valve. It has been shown to hold back 99.3 per cent of any ordinary dusts and weighs only 110 gm.

OVERSEAS CHEMISTRY AND INDUSTRY

Polish Work on Catalytic Action

LIGHT was thrown on the work of Polish scientists in the field of catalysts by Prof. Dr. A. Krauze in his article "The Mystery of Contact Catalysts," which appeared in the October-November, 1949, issue of *Przemysl Chemiczny*, the journal of the Central Association of the Polish Chemical Industry.

Certain defects or disturbances in the space lattices of contact catalysts result in the formation of free radicals. Contact catalysts, says Dr. Krause, are solid substances in which free radicals can exist. This, however, does not hold true for substances in solution or in the gaseous state.

Free radicals disappear when the space lattice is organised, as, for instance, during intensive heating of the material. Contact catalysts may therefore be looked upon as transitory radical structures.

These transitory phases are marked by a considerable increase of paramagnetism and by a great amount of energy. Free radicals are very active and readily enter into chemicals reactions because their outermost electron group does not form a complete octet. A chemical reaction of this type is not always a catalytic one; the radical catalyst can form a stable product with a foreign molecule and cause the blockade of the active centres of the catalyst. The action of the so-called " poisoners " depends upon this fact.

In order to set in motion a catalytic reaction, the radical catalyst possessing suitable radicals should react with the foreign molecule A in a radical, creating, or in a similar manner causing, its orientation and activation. As a result the molecule B becomes activated. The radical molecule A and radical molecule B easily form a new compound (AB) which is not formed in the absence of the catalyst (K).

Then the newly formed compound AB is freed from the catalyst. Catalytic reaction on the surface of the catalyst depends upon the rearrangement of certain electrons in the unstable radical compounds.

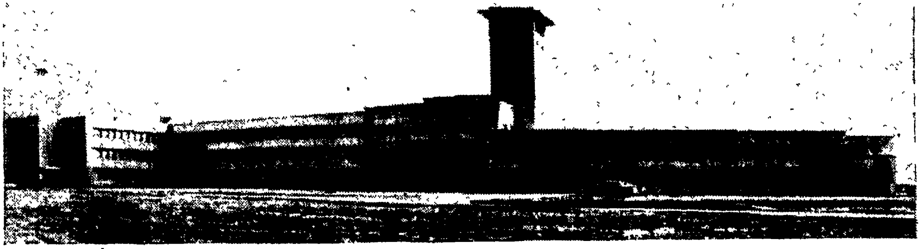
India to Establish Eleven State Laboratories

SCIENTIFIC projects in India are rapidly taking shape in the form of 11 new State supported laboratories. Two of these, the National Chemical and National Physical Laboratories have been opened in recent weeks.

The third, the National Fuel Laboratory is about to be officially opened at Dhanbad, centre of the coal mining industry, by Mr. Rajendra Prasad, president of the republic.

Although the official ceremony is still to come, work at the laboratory has been in progress for some time, and considerable interest is being taken in the results so far obtained in washing of coal and blending it for coking purposes. A country-wide survey of the various types and quantities of coal available has been initiated.

The National Fuel Research laboratory will also carry on research for the manufacture of synthetic liquid fuels, low temperature carbonisation, the utilisation of coal-tar products and the introduction of pulverised coal in boilers. One section will cover the dissemination of information.



India's intention to provide her people with scientific and industrial advantages on a scale comparable with leading Western countries is evidenced by the erection of this national physical laboratory; it is the second scientific centre to be completed

OVERSEAS CHEMISTRY AND INDUSTRY

WIDENING SCOPE OF RUSSIAN CHEMICALS

Important Shale Sources of Fuel Oil and Gas

IT is admittedly not easy to obtain reliable information about any sphere of Russian activity, especially the chemical, with its close connection, in some branches at least, with military policy. Nevertheless, Prof. Dr. Peter-Heinz Seraphim and Dr. Alfond Metzner have made a serious attempt to provide a partial view of the present state of Russian chemical industry (*Chemische Industrie*, 1950, *4*, 67-70).

Geographical Location

They point out in the first place that the general impression of a vast migration eastwards is not strictly correct. That there has been a considerable movement towards the east, partly for strategic reasons, is undoubted; but the fact remains that a very large proportion of Russian chemical manufacture is still located in the west, north and south.

The authors distinguish, in fact, five definite regions, each with marked characteristics dependent on natural resources: (1) Northern, from the Kola Peninsula to Leningrad and the shores of the Baltic, where the principal chemical interests are based on wood carbonising and tar distillation, and include also sulphuric acid, superphosphate, aluminium and rubber; (2) the Moscow district in its widest sense, where the predominent products are sulphuric acid, rubber, plastics, insecticides and drugs; (3) the Ukraine, where coal chemistry takes the lead, in association with soda, sulphuric acid, and superphosphate; (4) the Caucasus region, centre of the mineral oil industries, wood carbonisation, ferrous alloys, and metal compounds; (5) the Ural provinces, with an almost unparalleled array of mineral resources, and manufacturing industries based on them, including sulphuric acid and soda, besides silicates, bichromates, abrasives, bromine and iodine, aluminium-ferro alloys, calcium carbide, fertilisers, oxygen, etc.

In the north are nearly half the total forest areas of European Russia, that is 84 million ha, out of 172 million ha. In this area in recent years there has been large development of wood and cellulose industries along the shores of the Dvina, Petchora and other rivers, and of Lakes Ladoga and Onega. One of the largest enterprises is that of the combine at Ssegesha, in Karelia, on the Leningrad-Murmansk railway. Building was begun before the war, resumed thereafter and completed in 1948. Production includes cellulose, paper, turpentine oil, rosin, soap, and wood distillation materials. The older wood carbonising works and tar distilleries south of Leningrad, in the Riga, Vilna, and former Polish territories, are still small, compared with the vast resources of raw material.

In the extreme north, very extensive deposits of phosphate are being developed in the Kola Peninsula and neighbourhood, consisting largely of apatite, with some nepheline, and a phosphoric acid content of 28-30 per cent. The mineral reserve is estimated at about 2000 million tons. The crude ore is first concentrated to a 40 per cent P_2O_5 content at Kirowsk, and then sent to Leningrad and other centres where sulphuric acid is available. A certain amount is exported from Murmansk. In 1939 output of ore was 3 million tons, and was expected to be 3.5 million tons in 1949.

Pyritic Deposits

A valuable raw material for sulphuric acid manufacture and, therefore, superphosphate is the pyritic occurrences discovered in Karelia in 1947, in the Ssegesha district, about 15-20 km. west of Kotshoma Station.

Near Tichwin, in Leningrad province, are extensive bauxite deposits, and the Volchow and Tichwin combines have established two large aluminium works on the Murmansk railway, about 15 km. from Lake Ladoga. These were seriously damaged during the war but reconstruction is now complete. Besides aluminium, the Volchow factory produces alkali from nepheline concentrates received from the Kola mines. Bauxite deposits in these areas are estimated at 9 million tons; those in the Urals are about ten times as large.

The discoveries of oil and coal in northern Russia made many years ago have not so far contributed very much to chemical industry development. The oil-shales of the north-east, however, have become important sources of fuel oil and gas, and more recently of a new type of varnish. These shales extend from the north-east corner of Esthonia to the mouth of the

Narowa river, the principal centre of exploitation being Kochtla-Jarweh.

Total reserves of shale, according to latest estimates, are 5000 million tons. Within the next few years it is expected that the annual output of shale worked will be 10 million tons, yielding at least 2 million tons of crude oil by the use of the most modern distilling plant. It is of particular interest to note that in the shale residues after distillation uranium has been found. Uranium is said to be recovered on a large scale from the enormous accumulations of shale residues which have been mounting up from pre-war days. In the Russian Press recently reports have appeared of important discoveries of uranium in the Kochtla-Jarweh district. It is probable that these refer to the shale residues.

In the Moscow district, including the eastern localities of Yaroslol, Gorki, and Tschernoretshye, are some of the leading centres of Russian heavy chemical manufacture, fertilisers, synthetic rubber, and many other basic products. With a few exceptions, however, the works are of small or medium size. This part of Russia is not specially rich in raw material, and this is likely to be a handicap in further development. In the last five-year plan emphasis has been placed on the importance of using local materials as much as possible, both to save transport and for strategic reasons.

Coal Reserves

Chemical industry in the Ukraine is based mainly on the Donetz coal, manganese ores in Nikopol, and various phosphates reserves. Local coal output was expected to reach 88 million tons in 1950, that is, more than a third of the total Russian coal output. Reserves in this region are estimated at 90,000 million tons, of which 60 per cent is said to be economically available. New bituminous coal seams have been lately discovered west of the Dnieper.

In the Donetz basin a synthetic nitrogen industry was established soon after the first world war; later on three large factories were built, and although they suffered severely during the last war, reconstruction was soon completed. By 1948 reconstruction also in the sulphuric acid, superphosphate, and soda factories in the Ukraine had been completed, *e.g.*, in Vinniza (W. Ukraine), Odessa, and the Stalin works in Konstantinovka.

Other works in the reconstruction and development programme are: sulphuric acid, superphosphate, soda, in Dnieperpetrovsk, Gorlovka, Slavyansk, etc. Some of the world's best manganese reserves are in the Ukraine, namely, about two-thirds of the total, or 500 million tons, in and around Nikopol, with an Mn content of 35-48 per cent. The mine works have been completly restored and considerably enlarged. For 1950, the pre-war production level of 1.2 million tons is the target, and this is to be constantly increased in subsequent years. The manganese is largely used in the production of ferromanganese and other alloys in the Saporostal steel works and elsewhere.

Petroleum Production

Tungsten ores have also been discovered in considerable quantity in the Ukraine, and these, too, are being increasingly developed for alloy manufacture, so that there is now less dependence on Siberian tungsten. The western Ukraine has been enlarged by valuable additions of Polish territory with important petroleum and refinery works, *e.g.*, at Borislav and Stanislav. Production of crude oil, however, is relatively small, and is less than pre-war, which was 380,000 tons per annum.

In Caucasia the most important product is, of course, petroleum, of which in 1939 the output was about 28 million tons, in the three main centres at Baku, Grosny, and Maikop, or 88 per cent of the Russian total. Since the war, however, output has greatly declined, through war damage and natural depletion of supplies. Out of the Russian total of 30.6 million tons in 1948, the Caucasus contributed 20 million tons. Baku is likely, however, to retain its leading position for some time in the Russian petroleum industry. Moreover, large schemes are envisaged for the manufacture of petro-chemicals and general organic synthesis, *e.g.*, solvents, intermediates, synthetic detergents, on a large scale.

Other developments on the same basis comprise synthetic rubber, ethylene and derivatives (ethyl alcohol, butadiene, etc.).

Synthetic Rubber

Pressure polymerisation of butadiene, in fact, has been worked in Baku for the past ten years at the Ssumgait factory, and is to be further developed. Total production of synthetic rubber for 1950 is estimated at about 250,000 tons, and of this 25,000 tons would be *via* ethylene, 75,000 tons from calcium carbide, and the remainder from ethyl alcohol. Russia thus occupies second place in regard to synthetic rubber, with the U.S.A. first (502,000 tons).

The carbide process, said to have been adopted from the Du Pont method, is used in a large factory in Jerewan (Caucasian Armenia) which produces 60-70,000 tons of calcium carbide per annum. Another Armenian factory (in Kirowakan) has an annual output of 20,000 tons.

The Caucasus region is also the centre of an important and growing manufacture of pharmaceuticals and essential oils, based on home-produced raw materials, i.e., medicinal and aromatic plants. A large research institute has been established, the Transcaucasian Institute for Aromatic Plants. Among other things, cinchona plantations have been developed for production of anti-malarials. Aromatic plants are being cultivated in different parts of Armenia, *e.g.*, Ararat (Oktemberyan).

In Tiflis a pharmaceutical factory began the manufacture of penicillin in 1948, and already had been for some time engaged in producing quinine preparations, belladonna, urotropin, etc. Other pharmaceutical centres are in Batum, Sugdidi (Georgia) and in and around Baku. In Jerewan is a new factory, which, in 1947, commenced production of dry pigments from local raw material (2500 tons per annum). Another interesting product of Georgia is manganese. The deposits at Tschiatury of 175 million tons (estimated) are less extensive than those of Nikopol, but have a higher Mn content—52 per cent. The pre-war output of 1.6 million tons it was proposed to raise to 2 million tons in 1950, so that the total Russian output will be 3.5 million tons.

On both side of the Urals there is intense activity both in the chemical and metallurgical fields, and raw material for both is varied and abundant. On the western side, between the Ural Mountains and the Volga, are mineral oil fields which have been likened to a second Baku, but this is somewhat exaggerated. The oil is neither so plentiful nor of particularly good quality, since it has a rather high sulphur content. Nevertheless, these oil resources are being developed to the utmost degree.

Output before the war was 1.3 million tons, in 1948 5 million tons, and for 1950 is estimated at 8-9 million tons. Important raw materials in the Urals include iron- and copper-pyrites, crude phosphate, potash salts, bauxite and timber. The first named are used by about 10 sulphuric acid factories, but it is only recently that the copper-bearing ore has been used for acid making; the sulphur, formerly a waste-product in copper, lead, and zinc smelting, is now recovered on a fairly considerable scale.

Superphosphate is manufactured extensively, and potash is another important fertiliser, of which reserves are estimated at 18,000 million tons (mostly around Ssolikamsk). These, together with the newly acquired supplies in Galicia, will bring the Russian total potash output in 1950 to 700,000 tons K_2O. Bromine and iodine are both obtainable in the Ural regions. Ferro-alloys are manufactured on a large scale, and metallurgical production generally is varied and considerable, including aluminium.

Results of Bentonite Research in Italy

RESULTS of experimental work on the swelling of bentonite, factors governing the phenomenon and new methods of study were described by G. Vecchie, of the Ceramic Arts Institute, Faenza, in a paper read at a meeting of the Italian Chemical Society, Ferrara, in June last. The bentonite employed was of Italian origin, from the deposits of Daunia, in Puglia, and attracts interest on account of its functions in petroleum oil refining, soap making and other processes.

The purpose of the present research was to determine some of the factors governing the swelling of bentonite, namely: (1) mode of dispersion—agitation or grinding; (2) kind of water user—distilled or spring water; (3) ratio of solid to water during stirring or grinding; (4) ratio of bentonite to stones during grinding; (5) ratio of solid to water during sedimentation. The optimum conditions for securing swelling without the addition of electrolytes were also studied (*La Chim. e l'Ind.*, 1949, *31* (10), 351-357).

A considerable body of Italian research on the Pugliese bentonites has already been built up (*see bibliography*). Some of the first tests were to determine the effect of temperature and period of dispersion, in addition to the specific points or ratios enumerated above. Ratio No. 3, solid to water, was called S/A. while the corresponding ratio during sedimentation (5) was s/a. The tests comprised S/A 1: 1, 1: 2, 1: 3, and 1: 4; while s/a included 1: 50, 1: 25, etc., down to 1: 4. Stirring and grinding times were 30 min. to 24 hr., and the temperature range was 5° to 80° C.

The simple apparatus used comprised vessels in which the suspensions were prepared with grinding or stirring device, and a cylindrical sedimentation vessel of 500 c.c. fitted with mechanism for inverting it; this was done about 10 times after which it was left to rest for periods up to 24 hours.

Sedimentation curves were obtained with time as abscissae (hours) and heights or volumes of sediment as ordinates (cm^3) or "levels of swelling." Curves are given, showing variation of swelling levels as functions of time of stirring or grinding, using spring water.

The graphed and tabulated results show that (1) stirring is preferable to grinding in measuring bentonite swelling in aqueous medium; (2) distilled water is better than spring water owing to presence of salts dissolved in latter; (3) the best S/A ratio during dispersion is 1:3; (4) the best ratio bentonite to stones when grinding is 1:2; (5) sedimentation should take place in a totally enclosed space, insulated, and with strict temperature control, while at the same time, of course, permitting the sediment volume or height to be easily read; (6) maximum swelling is attained with a stirring or grinding time exceeding 12 hr.

Similar tests were made with distilled water, also several control or parallel tests, varying the different factors mentioned above.

Stirring and Sedimentation

An exponential relation is derived, and also graphed logarithmically, between volume of sediment and time of stirring, showing a linear increase of volume with duration of stirring, thus: $y = a - be^{-kx}$ where x is time of stirring in hours, y is height or volume of sediment in cm^3, a is constant corresponding to height limit, in the present case ≈ 500, b and k are constants depending on occupied values of x and y determined by experiment,, thus if $b = 340$ then $k \approx 1$.

From the results obtained it is evident that previous stirring of the material has a most important effect on subsequent sedimentation. More particularly a prolongation of this stirring causes a comminution of the bentonite particles, thus reducing still further the velocity of settlement. The method used for measuring swelling gives good results, easily comparable and reproducible, since both time and temperature are kept constant; that is to say the time elapsing between end of stirring and beginning of sedimentation. But it has to be emphasised that distilled water must be used.

The swelling of the bentonite in these experiments averaged 13 to 1. It is clear, however, that neither the material under test, nor the methods or conditions used, can always be exactly identical, so that it is advisable to carry out parallel or control tests in order to get a reliable mean. Colloidal substances, as is known, are particularly sensitive in this way.

Acknowledgment is made to Prof. M. Korach, chair of Industrial Chemical Plant, Bologna University, on whose researches, not yet published, much of the foregoing was based. The second half of the following bibliography contains several references to previous Italian work.

REFERENCES

[1] (*a*) Hofmann, Endell & Wilm, *Zeit. Krist.* 1933, *86*, 340.
  (*b*) W. Engelhardt, "On Silicate-Clay Minerals," *Forsch. Min. Krist. u. Petr.* 1937, *21*.
  (*c*) E. Magdefrau and U. Hofmann, "Crystal Structure of Montmorillonie, *Zeit. Krist.* 1938, *98*.
  (*d*) C. H. Edelman & J. Ch. L. Favejee, "Crystal Structure of Montmorillonite and Halloysite," *Zeit. Krist.* 1940, *102*.
[2] E. A. Hauser, "Colloid Chemistry in Ceramics," *J. Am. Cer. Soc.* 1942, *24* (6), 179-189.
[3] M. Utida, "Apparatus for Testing Bentonite, or 'Imbibition Bottle,'" *Jnl. Jap. Ceram. Assn.*, 1937, *45* (533), 319-20.
[4] M. Utida, "Jamagata Bentonite, III.—Imbibing Behaviour of Cylindrical Pieces of Bentonite and Application to Practical Grading." *Jnl. Jap. Ceram. Assn.* 1937, *45* (531), 133-4.
[5] Gruber, "Bentonite, Properties and Applications," *Bull. Mat. Grasses*, Marseilles, 1941, No. 6; Ref. *Chimie et Ind.* 1942, *47* (4), 498 D.
[6] American Colloid Co., "Methods for Evaluating the Properties of Bentonite." Data No. 251, p. 2 (1945).
[7] American Colloid Co., "Coagulating or flocculating Effects of Reagents on Bentonite-water Suspensions." Data No. 26 (1945).
[8] P. Bremond, "Study of the Viscosity of Barbotines." Report of Tech. Congress of the Ceramic Industry, Paris, 1938, pp. 155-165.
[9] V. Cagliotl and A. Baroni, "Activation of Bleaching Earths," *La Chim. e l'Ind.* 1940, *22* (6), 261-7.
[10] V. S. Prever and C. Goria, "Italian Bentonite: the Puglia Bentonite," *Ind. Mecc.* 1941, *23*, 92.
[11] P. Pastore, "Puglia Bentonite," *Ind. Mecc.* 1941.
[12] F. Savelli, "Puglia Bentonite, *Mat. Prime d'Ital e dell'Impero*, 1941, *6*, 319.
[13] V. S. Prever and C. Goria, "Pugliabentonite, *ibid.* 1941, *6*, 319.
[14] C. Andreatta, "Petrographic Study of Some Puglia Montmorillonitish Clays," *Ind. Min. Italia e d'Oltremare*, April, 1943.
[15] M. Rolla, "X-ray Study of Puglia Monmorillonite Clays," *Ind. Cer. e Silicati*, 1946, *1* (3), 1-8.
[16] A. Auletta, "Puglia Bentonite for Use in Foundries," *Tipographia "Aracne,"* Milan.
[17] L. Taverna, "Further Contribution to the Knowledge of Puglia Bentonite for Use in Foundries," *Stamperia "Conti,"* Bergamo, 1943.
[18] L. Padova, "Puglia Bentonite in Foundries," *Metal. Ital.* Mar-Apr., 1948.
[19] E. H. Vinther and M. L. Lasson, "Particle Size Measurements of Kaolin and Clays," *Ber. Deutsche Ker. Ges.* 1933, *14* (7), 259-279.

Australian Oil Refining

THE Vacuum Oil Company's refining plant at Altona, near Melbourne, Victoria, which began production in July last, is now reported to be completely erected. The total cost was about £A1 million, of which over 90 per cent was spent in Australia.

Technical Publications

TO make available the advantages of fluorescent lighting in industries where the atmosphere is laden with dust or vapour, Crompton Parkinson, Ltd., have introduced two types of fitting, which are described in a special pamphlet. The vapour-proof fitting (AV.1112), particularly suitable for atmospheric areas where moderate concentrations of acid or alkaline vapour may be present, has special silicone plastic washers sealing the lamp-ends. Lamps are easily replaced by removal of the end covers, each secured by a single captive finger nut. The dustproof fitting is of similar design, but the sealing is effected by felt gaskets.

* * *

SAFETY appliances for every industrial purpose ranging from goggles, respirators and protective clothing to equipment for handling corrosive liquids and fire retarding asbestos paint are included in the latest illustrated catalogue issued by Wallach Bros., Ltd., London.

* * *

HOW monel and nickel are used in widely varying types of plant and equipment is described in the current issue of "Wiggin Nickel Alloys" available from Henry Wiggin and Co., Ltd., Birmingham. Applications range from plant for synthetic detergents and ammonium sulphate saturators to soap-making equipment in use in countries as far apart as Sweden and Australia.

* * *

A GUIDE to its various pubilications has been issued by the Tin Research Institute. To simplify selection the list is divided into sections for the practical user, the analyst, the research worker and the general reader.

* * *

RESEARCH results of interest to chemists, metallurgists, engineers and other scientists are among a new group of 69 declassified and unclassified reports being released to industry by the U.S. Atomic Energy Commission.

* * *

CHEMICAL and physical properties of glycerin, its grades and applications, the U.S. specific gravity, density, viscosity, freezing points and relative humidity, etc., of glycerin solutions are fully described in a booklet "Why Glycerin for Alkyd Resins and Ester Gums?" This is the fifth of a series of booklets on technical advances and applications in the field of glycerin and its derivatives freely distributed by the Glycerin Producers' Association, New York.

* * *

STUDY of the physical properties of metals and thermal analysis of alloys in the atomic energy project necessitated the employment of many kinds of ceramic bodies. Many of these were made from zirconia, beryllia, thoria, and alumina by a new process known as slip-casting. Full details of the method are described by Wayne Calderwood, of Iowa State College, in "The Production of Ceramic Ware by Slip-Casting" (No. AECD-2737).

* * *

MODELS built to an exact scale have been increasingly used in recent years to check engineering, architectural and plant designs. The application of the acrylic plastic Plexiglas to this purpose is described in an illustrated feature in the Rohm and Haas Reporter (Vol. VII, No. 6). The value of amberlite ion exchange resins now available for laboratory and advanced research work is described.

* * *

POTENTIAL uses and fresh applications of pneumatic equipment together with a wide range of its products are described in a new catalogue of "Enots" pneumatic equipment available from Benton & Stone, Ltd., Birmingham.

* * *

ASSESSMENT of the work of the British Coal Utilisation Research Association, now housed at Leatherhead, was given by Sir Charles Ellis at the twelfth annual general meeting in his presidential address. Results of research work carried out including solvent treatment of coal, the smokeless combustion of bituminous coal and investigations into the performance of shell type boilers were outlined by Sir Charles whose speech is reported in the current issue (No. 8) of the "BCURA Quarterly Gazette."

Princess Sees Scientific Glass Made

During a two-day tour of Lancashire last week, Princess Margaret visited the world's largest sheet glass factory, Pilkington Brothers', St. Helens, where she studied spectacle glass production, which was virtually a German monopoly before the war.

The Chemist's Bookshelf

ORGANIC CHLORINE COMPOUNDS (preparation, properties, chemical behaviour and identification). Ernest Hamlin Huntress. Chapman & Hall, London. Pp. 1443. £11 10s.

Prof. Huntress is already well known to organic chemists for his publications dealing with the identification of organic compounds. His first major publication in this field, in conjunction with the late Prof. Mulliken, dealt with compounds of Order I (those containing carbon, hydrogen and oxygen). The present volume is to be considered an extension of this; compounds of Order III are now discussed in a similar but fuller manner. Compounds of Order III are those which contain carbon and chlorine with or without the addition of hydrogen and oxygen. In the present work the scope has been increased beyond the realm of identification alone to cover such subjects as methods of preparation and the more important chemical reactions. This extension is of particular importance in regard to this group of compounds since so many of them are of commercial importance.

The arrangement initially divides the compounds into three groups: solids, liquids which boil at atmospheric pressure, or liquids which boil only under reduced pressure or for which only boiling points at reduced pressures have been quoted. The compounds are listed in these three main groups in order of melting or boiling point except those whose boiling points are quoted at reduced pressure. These are listed in order of their molecular formulae. The amount of information about each compound necessarily varies according to its importance, yet a uniform method of presentation has been adhered to. The relevant facts concerning any compound can thus be listed under major divisions: the heading; fundamental physical constants; general data on other constants, preparation and properties; designation of special or preliminary tests; derivatives; references to the original literature. The heading comprises the location number (each compound is numbered to facilitate cross references); name (or names); structural formula; molecular formula; Beilstein reference. It is to be noted here that throughout the text the term empirical formula is used, although it is apparent that it is the molecular which is meant. There is some inconsistency also in the choice of names. It would be better to adhere to the Geneva system where possible (*i.e.*, in the aliphatics) and not to refer to substitutes sometimes by numbers and other times by Greek letters. The author has wisely not attempted to select " correct " physical constants. Those chosen are melting and boiling points, density and refractive index.

The third section contains a wealth of information ranging from the formation and composition of azeotropes to methods of preparation and details of the main chemical reactions of the material. Much information on preliminary tests and the formation of derivatives by which the compounds may be identified is offered in the two following sections and finally for each compound there is a list of pertinent references, including, in view of the industrial importance of many of the compounds, material published in patents.

The book contains details of 1820 individual compounds distributed among 366 groups of isomers. The literature has been reviewed to 1945 and a supplemental section deals with references which appeared in 1946-7.

There are five indices, of which three are novel and two conventional. Apart from an index of compounds by names in alphabetical sequence the compounds are also classified according to their molecular formulae, percentage chlorine content, molecular weight and chemical types.

While this volume does not set out to rival Beilstein, it nevertheless provides a great deal of important information on a selected group of halogen compounds. The care with which this information has been collated and the clarity with which it is presented have produced a unique storehouse of facts for the organic chemist, whether research worker, analyst, or a plant operator.—G.D.

• PERSONAL •

SPECIAL posts for individual research workers of exceptional merit have been created under provisions included in the White Paper on the Scientific Civil Service. The following have been appointed senior principal scientific officers: Dr. E. F. G. Herington, of the Chemical Research Laboratory, DSIR, physical chemist who has made notable contributions to knowledge of the mechanism of catalyst polymerisation and the theory of solutions; Dr. C. H. Lea, of the Low Temperature Research Station, Cambridge, author of many works on the chemistry of fats. Other promotions, to the grade of deputy scientific officer, are: Dr. R. A. Frazer, of the National Physical Laboratory, and Mr. S. B. Gates, of the Ministry of Supply. Both are specialists in aerodynamics.

Sir John Cockcroft, director of the Atomic Energy Research Establishment, was decorated, in Paris last week, with the cross of a Chevalier of the Legion of Honour. The award commemorates his scientific work during the war and the aid he has given to French scientists.

The Fine Chemicals Group of the Society of Chemical Industry has elected the following officers: Dr. F. Bergel, chairman; Dr. W. Mitchell, vice-chairman; Dr. H. J. Barber, hon. secretary; Dr. B. A. Hems, hon. treasurer; Dr. F. Hartley, hon. recorder.

Dr. Edwin M. H. Wildt, Leicester, and Mr. H. G. Greg, Oak Brow, Styal, Manchester, are to receive the Textile Institute Medal for distinguished services to the textile industry in general, and to the Institute in particular.

The Dominion Tar & Chemical Co., Ltd., whose headquarters are at Montreal, Canada, has announced the appointment of Mr. Arthur H. Martin as executive vice-president, and of Mr. D. S. Thomas and Mr. W. N. Hall as vice-presidents. Mr. Martin is president of the Standard Chemical Co., Ltd.

Mr. H. N. Ridley has been awarded the Linnean Medal for 1950. The presentation will be made at the anniversary meeting of the Linnean Society on May 24.

Mr. Donald Wilfred Maddock, chairman and managing director of John Maddock & Co., Ltd., ironfounders, Oakengate, left £28,511 (£28,257 net).

At the annual meeting of the Society of Dyers and Colourists, held in Leeds last week, Mr. Fredk. Scholefield, head of the department of textile chemistry at the Manchester College of Technology, was elected president. Mr. H. Jennison and Mr. J. Barritt were re-elected hon. treasurer and hon. secretary respectively. The new vice-presidents are Mr. F. Farrington, Mr. F. L. Goodall, Mr. J. M. Goodall, and Mr. J. M. Preston. At the annual dinner which followed, the society's gold medal for the best application of physical chemistry to the theory of dyeing was handed to Dr. S. M. Neale, of the Manchester College of Technology.

Mr. B. H. Turpin, a director of Quickfit and Quartz, Ltd., has returned from a visit to Norway, Sweden and Finland where he has been investigating the individual requirements of Scandinavian firms. Mr. D. Curtis, technical adviser to the company, has returned from Belgium where he has been to see about the supply of industrial plant.

The council of the Institute of Welding has awarded the Sir William J. Larke Medal, for the best paper read to the institute during the year, to Mr. R. G. Braithwaite, who is welding consultant to Braithwaite & Co. (Structural), Ltd., and was last year chairman of the Birmingham branch of the institute. His paper deals with the control of distortion in arc welding.

British recognition of the debt which contemporary metallurgy owes to the distinguished work of Prof. Albert Portevin was acknowledged by the Institute of Metals at a luncheon in London last week. Mr. H. S. Tasker, the institute's president, presented to the professor the Platinum Medal for Services to Metallurgy, the institute's highest award.

OBITUARY

The death is announced of Major A. J. Forrest, managing director of British Viscoleum Fuels, Ltd., and a director from the company's inception in 1934.

Captain Edward Davies, of Rhydymwyn, an ex-alderman and former chairman of Flintshire County Council, whose death is announced at the age of 84, was an authority on lead mining, and a former manager of North Hendre Mining Company.

• HOME •

Paint Manufacturers' New Address

The Society of British Paint Manufacturers, Ltd., has removed its offices to Grosvenor Gardens House, Grosvenor Gardens, London, S.W.1. The telephone number is VICtoria 2186-8.

Prices of Oils and Fats

No change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the five week period ending May 6, states the Ministry of Food. The entry relating to mixed sunflower/whale acid oil will be deleted from the list of prices. No supplies of the mixture are available.

Largest Oil Tanker

Princess Margaret consented to officiate at the ceremony, last Tuesday, to launch the s.t.s. *Velutina*, 28,000 tons, at the yard of Swan, Hunter and Wigham Richardson, Ltd., Wallsend-on-Tyne. The tanker, the largest yet built in the United Kingdom, is the first of four similar vessels for the Shell fleet. They will be mainly used in carrying crude oil from the Middle East to the company's new refineries at Shell Haven, Essex, and Stanlow, Cheshire.

Size for Synthetic Fibres

New starch derivatives, expected to have wide application in the sizing of nylon, acetate rayon and vinyon yarns have been developed by Dr. J. Lolkema, of W. A. Scholten's Chemische Fabriken N.V, states a correspondent of *The Financial Times*. Etherification or esterification is said to confer marked stability and enable continuous operation of the warp sizing, finishing and printing processes, regardless of temperature difficulties.

Cork Oil Refinery Reopening

With a capacity to produce 6 million gal. of refined spirit annually, Cork Harbour Oil Wharves, Ltd., at Haulbowline, is preparing for a resumption of pre-war activities. The old wooden wharf which had accommodated tankers, and which became unserviceable during the war, is to be replaced by a reinforced concrete wharf which will be ready at the end of the year. With a 86 ft. berthage, this will accommodate the largest tankers, which will bring the crude oil from Central and South America, for refining into motor spirit and fuel oil.

Textile Institute Associateship

The Diploma in Textiles, awarded by the Leicester College of Technology, and the Rayon Production Certificate, awarded at Coventry Technical College, have been added by the Textile Institute to the list of qualifications recognised for the election of members to associateship.

Courtaulds, Ltd., Leaving Accrington

Courtaulds, Ltd., has decided to vacate its engineering works at Clayton-le-Moors, near Accrington, in the latter part of this year, and to concentrate all engineering work at Coventry. The Accrington factory is responsible for the maintenance, manufacture and repair of rayon-spinning machinery.

Radiochemical Centre

The agreement whereby Thorium, Ltd., operated the Radiochemical Centre, Amersham, Bucks, as agents for the Ministry of Supply, terminated on March 31, and from that date the Ministry is carrying on the business of the centre directly. Dr. Grove will continue in charge of the centre.

KID Exemptions

The Treasury has made an order exempting the following articles from Key Industry Duty for the period beginning April 3, 1950 and ending June 30, 1950: allyl chloride (a chloropropylene); anis aldehyde; ethylbenzene; R. stearic acid; *m*-4-xylenol. The Order is the Safeguarding of Industries (Exemption) (No. 4) Order, 1950, and is published as Statutory Instruments, 1950, No. 460.

Exploding Boiler Wrecks Dye Works

Exploding with a terrific roar, shortly before midnight on March 29, a five-ton vertical boiler tore through a power-house roof of an Oldham dye works, rose about 20 feet into the air and fell into the main building, which was wrecked. Nearby houses had narrow escapes. Caught by the blast, the 35 ft. high steel boiler chimney crashed into the works yard. Only one wall of the boiler-house was left standing. The main building of the firm, Resistant Finishers and Cleaners, of Prince Albert Street, Oldham, was full of rubble. The manager of the dye works, Mr. J. W. O'Neil, said he thought the whole works would be condemned. Fortunately the boiler had missed the dyeing shed at the rear, where most of the expensive equipment was stored.

NEXT WEEK'S EVENTS

TUESDAY, APRIL 11

Society of Instrument Technology

Manchester: College of Technology, 7.30 p.m. Ll. Young: "Pneumatic Relays and Their Use in Control Systems."

WEDNESDAY, APRIL 12

Society of Chemical Industry (Food Group)

London: Burlington House, Piccadilly, W.1, 6 p.m. Annual general meeting, 6.30 p.m. Prof. S. Zuckermann: "Pounds, Dollars and Calories."

The Institute of Welding

Manchester: College of Technology, 7 p.m. Annual general meeting, followed by films.

THURSDAY, APRIL 13

The Chemical Society

Dundee: University College, 5 p.m. Dr. F. S. Dainton: "Chemical Reactions Induced by Nuclear Radiations."

The Royal Institute of Chemistry

Luton: Kings Fare Restaurant, King Street, 7.30 p.m. (with Luton Scientific Association). Dr. L. R. Bishop: "Brewing in Britain."

The Fertiliser Society

London: 26 Portland Place, W.1, 2.30 p.m. R. M. Collins: "Mining and Production of Rock Phosphates in Florida."

Incorporated Plant Engineers

Peterborough: Eastern Gas Board Theatre, Church Street, 7.30 p.m. Film on lubrication presented by the Vacuum Oil Co., Ltd.—"The Inside Story."

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 5.15 p.m. Hamid Ali (Deputy trade director, Office of the High Commissioner for Pakistan): "Projected Industrial Development in Pakistan."

FRIDAY, APRIL 14

Institution of Chemical Engineers

London: May Fair Hotel, Berkeley Street, W.1, 11 a.m. Annual corporate meeting; 12 noon, Presidential address. Prof. D. M. Newitt: "Technology and the State." 7.30 p.m., dinner.

Oil and Colour Chemists' Association

Manchester: Engineers' Club, 6.30 p.m. Annual general meeting.

Society of Chemical Industry

Wolverhampton: Technical College, 7.30 p.m. Prof. P. M. S. Blackett: "Operational Research."

SATURDAY, APRIL 15

The Scientific Film Association

London: University Institute of Education, Malet Street, W.C.1, 10 a.m. to 9.30 p.m. Conference: "Photography and Cinematography by Invisible Radiation."

RADIOACTIVITY CONGRESS

Problems of Industrial Application

INDUSTRIAL applications of radioactivity will be discussed at a public conference to be held from May 19 to 21 at Birmingham University, Edgbaston.

While mainly designed for those concerned with the technical side of industry—engineers, research workers and industrial chemists—many of the lectures will be of a general nature.

Basic facts of nuclear physics will be given at the start of the course, which will also deal with isotopes, radioactive decay and radiation.

The need for precautions when handling isotopes and the importance of health monitoring will be emphasised, and the meeting will conclude with a discussion.

The conference has been organised jointly by the Birmingham branch of the Atomic Scientists' Association and the extra-mural department of Birmingham University.

Meetings Postponed

THE meeting arranged by the North Western Branch of the Institution of Chemical Engineers at the College of Technology, Manchester, on April 15, at 3 p.m., has been postponed until April 22, at the same time. G. E. Charlish and E. J. Heeley will present a paper on "Acid Resistant Vitreous Enamelled Chemical Plant—Some Observations on the Enamel Layer."

The Plastics and Polymer Group of the Society of Chemical Industry announces that the date of its next meeting has been changed from April 11 to April 17, at 6.30 p.m., when Dr. D. Cleverdon and Mrs. D. Laker will present two short papers on "The Molecular Weights of High Polymers," at 26 Portland Place, W.1.

Reclamation of Textile Fibres

A SPECIAL one-day conference on the reclamation of fibres has been arranged by the Textile Institute and will take place at Morley Town Hall on Tuesday, April 18. Subjects to be discussed include: general review of the industry; reclamation of wool fibres; present and future methods of separating textile fibres; dyeing of pieces made from reclaimed fibres and finishing of fabrics containing wool and other fibres. The speakers will include Professor J. B. Speakman, Dr. C. S. Whewell (Leeds University) and Mr. N. C. Gee (Dewsbury Technical College).

◆ OVERSEAS ◆

New Austrian Sulphuric Acid Plant

The Austrian Metal and Colour Co., Ltd., is erecting a new retort for roasting pyrites, to be connected with a new sulphuric acid plant.

Ciba's Lower Earnings

Ciba A.G., Basle, reports a net profit, for the financial year 1949, of S.Fr. 14,085,141 (14,119,734 in 1948) after having written off depreciation amounting to S.Fr. 8,453,763. More than S.Fr. 4 million has been allocated to welfare and research funds.

Bihar Fertiliser Plant Nears Completion

The important Indian fertiliser plant at Sindri, Bihar, is expected to begin operation in August. Output is scheduled to be about 350,000 tons annually. Thirty Indian experts, who are to work at the plant, have almost completed their training course in Britain and the United States.

Trade with Indonesia

Trade talks have recently been concluded in London between the Government and Indonesia. Quotas will be made available for United Kingdom exports to a value of over £7 million. Principal items include chemicals and pharmaceuticals, textiles, and electrical equipment. Imports from Indonesia are estimated at £12 million and will include copra, palm oil and rubber.

German Fertiliser for Holland

German nitrogenous fertiliser manufacturers are reviving their important pre-war connections with Holland, one of their chief markets. It is reported that the Ruhr Chemie A.G. Oberhausen-Holten, is to supply by river a large quantity of ammonium nitrate. This development is said to be particularly welcome, as German farmers are not taking up fertilisers in sufficient quantity.

Italian Chemical Company's Expension

The capital of Condor S.p.A. per l'Industria Petrolifera e Chimica, Rome, has been increased to three thousand million lire, to enable the company to finance the construction work now in progress. This comprises a seaport installation at Genoa and a pipe-line for the transport of crude oil from Genoa to Rho, near Milan, with an annual capacity of about 12 million barrels (1.5 million tons) of crude oil, and a refinery at Rho with a capacity of more than 6 million tons per annum.

India's Manganese Ore

The increasing volume of India's exports of manganese ore, of which 355,000 tons were shipped in 1948, is seen in the total of 269,293 tons sent abroad in the first six months of 1949. Some 59 per cent went to the U.S.A.

U.S. Mining Equipment for Ruhr

A time and labour saving automatic coal loading machine, manufactured in the U.S.A., has recently been installed in the Walsum mine. Other Ruhr mines are expected to receive U.S. equipment in the near future.

Reduced Soap Imports

The large reduction in India's imports of soap last year is reflected in the total of 1057 tons for the first seven months of 1949; imports during the whole of 1948 were 18,805 tons. Home production of soap in the first nine months of the year totalled 90,236 tons.

Modernised Fertiliser Plant

The main building of the International Minerals and Chemical Corporation, Texarkana, Arkansas, which was destroyed by fire on February 23 is to be rebuilt immediately. The new building will incorporate improvements for the modernisation of the company's fertilser plants.

Austria Expands Fertiliser Exports

Efforts are being made by the Austrian Nitrogen Works, Ltd., Linz (erected by the Germans during the war) to find foreign markets for nitrogen fertilisers and other products. Poland has given a second order for 10,000 tons to requite a delivery of Polish coal. A quantity of 7500 tons is to be shipped to Greece and a small delivery has been made to the Sudan. Egypt is receiving 2500-5000 tons a month and negotiations are in progress with South Africa.

Ammonium Nitrate: No Explosion

The report of a fire which destroyed a storage building of the Spencer Chemical Company at Independence, Kan., U.S.A., containing 27,667 100-lb. bags of ammonium nitrate, notes that this rapidly burning fire caused no explosion. A report issued by the company reveals that examination of the wreckage showed intimate mixture at elevated temperatures of molten ammonium nitrate with aluminium, copper,- glass, rubber, iron, zinc, asphalt and carbonaceous materials.

The Stock and Chemical Markets

DESPITE the substantial surplus with which the financial year has ended, the City continues to assume that it will be mainly a "no-change" Budget and that there will be little easing of the burden of taxation. Stock markets have accordingly remained cautious, although industrial shares were inclined to strengthen. Movements on balance were, however, small. Talk in the City anticipates the possibility that the Chancellor may want limitation enforced by law.

Shares of chemical and allied companies have been quite well maintained, and Imperial Chemical were active around 43s. in anticipation of good financial results for the past year. The yield is 4⅝ per cent, and there is, of course, every confidence that the 10 per cent dividend will be maintained. Success of the debenture issue kept Fisons ordinary shares firm at 21s. 6d. Monsanto eased to 48s. 1½d., Brotherton 10s. shares changed hands around 19s. 4½d., Laporte Chemicals 5s. units were 9s. 4½d., Albright & Wilson 28s. 7½d., and Burt Boulton 25s. 8d.

British Glues 4s. units were sought and rose to 20s. 7½d. on market talk of a possible increase in the dividend. Borax Consolidated were firmer at 51s. 6d., but British Oxygen eased to 94s. on the preliminary results. The latter company, the directors point out, enjoyed a record turnover last year, but on the other hand, costs rose, and as a result, net profits were lower at £905,047, compared with £1,200,531. Nevertheless, the unchanged 20 per cent dividend was earned twice over.

British Aluminium is another company which has had to report a moderate reaction in profits; the shares eased to 40s. at which there is a 5 per cent yield on the 10 per cent dividend. In fact, financial results now coming to hand are showing falling off in profits owing to higher costs and growing competition both at home and abroad.

It is being assumed in the City that during the next 12 months many companies will probably have to make moderate reductions in dividend payments. Such a result would underline the unfairness of dividend limitation in the periods of prosperity. Dividend limitation and the restrictions on share bonuses are already making difficult the raising of new capital for industry.

The 4s. units of the Distillers Co. have been firmer at 17s. 3d. and United Molasses (39s. 9d.) were being bought, in anticipation of the financial results. Glaxo Laboratories shares have fluctuated around 44s. 4½d. Among plastics, British Xylonite came back sharply to 65s. following their recent rise. Cement shares were firm with Associated Cement at 77s. Rugby Cement 5s. shares were active around 17s. on the full results. The prosperity of the cement industry is due largely to export trade and the circumstance that British cement is the cheapest and best.

Iron and steel shares have been steadier, and elsewhere, Staveley improved to 75s. 6d. Powell Duffryn were active around 28s. 6d. on the company's deal with Socony-Vacuum Oil. Boots Drug have been firm at 46s. 3d. Oils were uncertain (Shell at 63s. 1½d.), but Ultramar and British Controlled were prominent among lower-priced shares.

Market Reports

THE curtailment of the working week by the Easter holiday has precluded any expansion of contracted delivery specifications. There has been no appreciable change in prices, with the exception of the changes reported last week in the values of sulphuric acid and zinc oxide. Most of the industrial chemical markets remain steady.

MANCHESTER.—There has been little change in the relatively steady conditions of the chemical market, which now faces the prospect of reduced activity during the Easter period. Caustic soda and other alkalis are being taken in good quantities and there is a steady trade in ammonia and magnesia products. The potash compounds generally are being accepted as they become available. Superphosphate and compound fertilisers are meeting a brisk inquiry.

GLASGOW.—Day to day business in the Scottish chemical market has maintained the average level. There have, however, been indications that a number of firms are restricting their buying, particularly where purchase tax is involved in the final product, until Budget proposals are announced. Xylol and toluol continue to be in very short supply and trisodium phosphate is also difficult, as are a number of other phosphate compounds. Interest is being shown in a new type of textile dyestuff now being introduced into this country. This dyestuff has been well tried in America for some years.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Chromocine, Ltd., London, W., chemical merchants. (M., 8/4/50.) March 6, £1000 charge, to C. R. Enever, Freeman & Co., London; charged on 147 and 149 Kensal Road, W.10. *£4000. January 12, 1950.

New Process Welders, Ltd., London, S.W. (M., 8/4/50.) March 9, £1575 charge, to S. A. Harris, London; charged on ground floor of Boundary Warehouse, Powis Mews, Kensington. *£802. September 14, 1948.

Satisfaction

Lafarge Aluminous Cement Co., Ltd., London, W. (M.S., 8/4/50.) Satisfaction March 18, of mortgage registered July 6, 1944.

Increases of Capital

The following increases in registered capital have been announced:—R. Cruickeshanks, Ltd., from £50,000 to £100,000; James Laing, Son & Co. (M/c.), Ltd., from £200,000 to £800,000; Pest Control, Ltd., from £1,000,000 to £1.250,000.

New Registrations

Redep, Ltd.

Private company. (479,886). Capital £8000. Manufacturers of scientific equipment and apparatus, etc. Other particulars similar to Ellis Research and Testing Laboratories, Ltd.

"Naarden" (London), Ltd.

Private company. (480,002). Capital £10,000. Manufacturers and dealers in chemicals, acids, gases, oils, etc. Directors: W. A. Van Dorp and A. G. Drew. Solicitors: Aukin Courts & Co., 5 Queen Anne Street, W.1.

Parliamentary Topics

MR. E. G. Gooch asked the Home Secretary if he was aware of the dangers to agricultural workers involved in the use of some of the new insecticides, particularly DNOC, dinitro-orthocresol, and parathion, diethylparanitro-phenylthiophosphate, used as sprays for crop protection. He believed they were deadly in their effect upon men and asked if their use was to be banned. In a written answer, Mr. Chuter Ede replied that the Poison Rules controlling the sale of these insecticides provided for a warning notice on the containers in which they were sold. If reasonable care were taken in their use, there should be little risk.

PROBLEMS connected with hazards of dust in iron foundries were raised in a question by Mr. M. MacPherson. In a written answer, the Minister of Labour stated that the Factory Department had carried out an investigation into the incidence of silicosis among various classes of foundry workers and the results would be published shortly. Findings so far indicated that certain dusts should be regarded as dangerous to health, and that those generated in substantial quantities should, as far as possible, be suppressed at the point of origin. Proposals had been made to restrict the use of dangerous parting powders.

Chemical Employment

NUMBERS of persons employed in the chemical and allied trades in the last two months of last year remained fairly steady. Totals (in thousands) were: November 445.4. and December 444.4.

Analysis of these figures given in the Ministry of Labour *Gazette* was as follows:

	Nov.	Dec.
Coke ovens and by-product work	17.0	17.0
Chemicals and dyes	201.7	201.5
Pharmaceuticals, etc.	35.0	34.6
Explosives, etc. ...	37.4	37.3
Paints and varnish	38.3	38.2
Soaps, glycerin, etc.	49.0	48.4
Mineral oil refining	36.1	36.4
Oils, greases, glues, etc.	30.9	31.0
	445.4	444.4

Industrial Savings

Fort Dunlop has in 1949 again broken its own record for National Savings—£99,160, against £89,028 for 1948. The total for ten years is £756,542.

Non-Ferrous Metal Stocks Increase

Higher February Output

FEBRUARY was marked by an all-round improvement in the levels of Government and consumers' stocks of non-ferrous metals, compared with the same month of last year.

Production of copper, zinc and lead was higher than in February, 1949, but totals for tin are not yet available, according to the monthly figures supplied by the British Bureau of Non-Ferrous Metal Statistics from which the following details have been abstracted.

UNWROUGHT COPPER

	Long Tons Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumer	40,402	89,798
Imports	2,552	13,279
PRODUCTION:		
Primary	—	8,677
Secondary	2,079*	5,322
CONSUMPTION:		
Primary	9,374	25,506
Secondary	—	14,574
Exports	749†	14
CLOSING STOCKS:		
Govt. and consumers'	33,348	85,969

*Rough Copper.

†Rough Copper despatched to Belgium.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	22,917	long tons
Alloyed copper products	24,390	„ „
Copper sulphate	3,851	„ „

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	32,968	54,745
Imports	7,040	7,062
PRODUCTION:		
Virgin and remelted ...	—	5,503
CONSUMPTION:		
Virgin (incl. debased) ...	6,750	19,440
Remelted and scrap ...	—	7,470*
Exports and Re-export	—	9
CLOSING STOCKS:		
Govt. and consumers'	33,258	48,210

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	55,937	4,193	—
Other stocks ...	59	—	—	—
IMPORTS ...	—	17,280	—	157
PRODUCTION ...	219	—	5,468	—
CONSUMPTION ...	193	12,719	5,245	8,200
Exports	—	17	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	59,707	4,416	—
Other stocks ...	85	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,979*
IMPORTS	315
PRODUCTION	—
CONSUMPTION	1,819
EXPORTS AND RE-EXPORTS	351

* Amended figures to represent Government's stocks wherever located.

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	335
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	337

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	49.35

Aluminium Nomenclature

A CHART relating in simple form a new system of nomenclature of aluminium alloys with those it replaces has been prepared by the Aluminium Development Association and is now available in a design for wall mounting. Fabrications, both cast and wrought, that have been familiar under several different systems are being collated by the British Standards Institution into one scheme for general engineering purposes.

The chart shows the materials under their various forms, and, in addition to the BS classfications and the numbers of related specifications, it states the approximate composition of each item in terms of the major constituents.

Certain BSI specifications have yet to be published. The related schedules and specifications listed are the nearest equivalents to those in the new series of standards, but may differ from them on points of detail.

Fifteen Per Cent More Aluminium

American production of primary aluminium in December totalled 41,161 short tons, a gain of 15 per cent over the November figure. Production at the two plants of the Aluminium Company of America which had been strikebound for over seven weeks was resumed, following a settlement effective on December 7. The preliminary total output for 1949 was 603,462 tons, compared with 623,456 tons in the peak peacetime year, 1948.

Shortage of Technologists

AT the annual meeting, in Leeds last week, of the Society of Dyers and Colourists, Mr. F. Scholefield, the newly appointed president, said technical education had been the *raison d'être* of the society and it continued to be its most important function. Discussions were now going on regarding the training of technologists, and there had been a suggestion for the formation of a society of technologists charged with raising the standard of technology and awarding diplomas.

The recruitment of skilled men into the industry was a serious problem, he added, and the shortage would soon have its effect on the efficiency of the industry. There was a dearth of properly trained young men coming into the industry. He urged that the university course should be extended to four years.

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Volume LXII 15 April 1950 Number 1605

Scientific Writ

"THE inability of most British scientists to write even a proper scientific paper, let alone a popular article, is now causing such general concern that a number of big firms and scientific societies are appointing advisers in English literature to help their inarticulate colleagues to express themselves intelligibly and with precision. It will take a long time for this movement to produce much effect, and it is a question whether the regular writing of English essays should not become a part of the university training of every science undergraduate." This broadside was fired by the editor of *Science News* (Penguin Books, March, 1950) in its latest and fifteenth issue. Mr. J. L. Crammer, the editor, reveals that from its first publication in 1946, *Science News* has never been showered with suitable or near-suitable articles; it has had " to wring contributions out of authors ".

Mr. Crammer is, of course, associating himself with the view of the majority when he deplores the poor performance of some scientists at the writing desk. There are distinguished exceptions; but the Institute of Physics, the Royal Institute of Chemistry and the Institutions of Civil Engineers and of Electrical Engineers, in their recommendations for post-war education were each moved to emphasise the need for improvement in the general standard of literacy and suggested that this might be achieved if more attention was given to this kind of training at the universities. Mr. Crammer's suggestion about essay writing as a basic step is obviously sound. It has in mind the paradox that specialised courses in, say, chemistry may be compulsorily associated with courses in physics, mathematics, French, and German, yet not with the language in which all the future work of the scientist is likely to be expressed. It should not be supposed that familiarity with the essay form and cultivation of " a literary style " would be enough. The lucid presentation of scientific facts, ideas, and arguments is in itself a specialised branch of writing, and if tomorrow's scientists are to be better equipped than today's they will require specialised instruction.

Most of the literary styles that produce delightful results in the hands of the essayists cannot by any means be made to serve the needs of a scientific statement of facts. Most of the leavening devices of stylists are subjective, and science, even popular science in its best sense, cannot afford

On Other Pages

Leader:
Scientific Writ . . 525
Notes and Comments:
I.C.I. in Rhode Island . . 527
Diplomatic Problem . . 527
Telling America . . 527
Second Safety Conference . . 528
New and Strange . . 528
British Styrene . . 529
Streptomycin Claim . . 529
New Atomic Plant . . 529
U.S. Specialists' Visit . . 529
Basic Chemicals in January . . 530
English Lead Prospects . . 530
Modern Nitric Acid Plant . . 531
Parliamentary Topics . . 532
Freedom for Steel Industry . . 533
Changing Metal Prices . . 533
New Acetylating Agent . . 534
Monomeric Acrylic Esters . . 535
Scope of the New Detergents . . 536
U.S. Engineers to Review New Processing Factors . . 538
The Alkaline Earth Plumbates . . 539

OVERSEAS CHEMISTRY AND INDUSTRY

Progress of Indian Fertiliser Plant . . 542
Indian Industries Seeking Materials and Equipment . . 542
Scientific Research in Belgium . . 543
New Industries Planned for Ceylon . . 544
Australia's Exploration for Pacific Oil . . 544
The Census of Production . . 547
Federation News . . 549

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to abandon objectivity in its presentation. The essay, especially in the universities where the need to express more or less original ideas may be expected to be met for the first time, can, however, certainly instil the principles of clear and simple writing as well as something of its architecture. Something more is needed to convert that basic ability into a faculty for interpreting science to such differing readerships as (a) other scientists, (b) business colleagues, and (c) the general public or certain sections of it.

Too many scientists have intolerantly assumed that the production of papers for scientific journals is the most that can be asked of them. Somewhat unfortunately, the application of science depends in one respect upon its comprehension by many people who are usually not scientists at all—directors of industry, politicians, administrators, and possibly the journalists who help to form public opinion. It is futile to deplore the neglect of scientific developments if the primary responsibility of explaining the possibilities has itself been neglected.

It is in this field of expression, in the report to industrial or government administrators, that scientists most often display their weakness as writers. It is not quite true, despite Mr. Crammer's extreme condemnation, that few scientists can produce proper scientific papers. About half the papers that appear in the appropriate journals reach a passable standard and most of them achieve their somewhat limited aim; they are written by scientists for scientists, and an exceptional degree of author-reader co-operation relieves the writer of much of the burden. The sort of objectivity met there eliminates most of the decorative devices which make for easier reading; if the text is heavy laden with technical terms and a modicum of "scientific shorthand" it is not to be condemned on those grounds. In the discussion of any specialised subject among specialists the proper use of technical terms is an essential form of economy. Unhappily so many scientists make an almost identical approach to the task of writing for other types of readers, employing the same style and the same tools. Their inadequacy then is no less because it is blissfully unrealised.

What might be regarded as the blue-print for a generally acceptable standard in scientific writing has

(*continued on page* 528)

Notes and Comments

I.C.I. in Rhode Island

INVESTMENT of American capital in the industries of other countries was one of the recommendations offered in President Truman's "Fourth Point" in the campaign to foster economic stability around the world. American chemical industries, in common with the President, had not foreseen that it might occasionally be even more profitable to put foreign capital into U.S. industry. That is not a precise description of the acquisition by I.C.I., Ltd., of about 70 per cent of the common stock of Arnold, Hoffman and Co., the old-established chemical undertaking of Rhode Island, because the purchase will be financed by a New York Bank loan, not by drawing upon our strained dollar reserve. The enterprise, however, has apparently caused some deep—and surprised—thinking in American chemical circles, to which *Chemical Engineering News* (*28*, 12, 923) bears witness. The American chemical paper, recognising that the result of the last General Election makes rather more remote the possibility that U.K. chemical industries may become State monopolies, foresees a highly embarrassing situation if the "snatch" should ever be made.

Diplomatic Problem

"THERE is the interesting possibility, if not probability, that at some future date the British Government may have a direct competitive position in American chemical industry," observes *C. and E.N.*, and offers interesting speculation upon what would be the attitude of the U.S. Department of Justice if it did not approve of the trade practices of the Anglo-American group in Rhode Island. "Just how you cite the British Government in such a situation is but one of the intriguing possible situations . . . ", speculates the American commentator. If that grotesque misuse of Administration came about—the anomaly would not be peculiarly American. A British Chemicals Corporation would, in fact, become a competitor with the native industries in fields far wider than this. Offshoots of British chemical enterprise flourish in more than half the countries of the world. The blame would not be theirs if they then instigated the biggest "hiving off" operation on record to defend their independence, regardless of the great impoverishment here.

Telling America

A BETTER propagandist for British chemical industry than Sir Frederick Bain would be hard to find. A few weeks ago his defence of the industry and confidence in its ability to overcome present difficulties was explained to Canadian members of the SCI and the Chemical Institute of Canada. Now a report in the American *Chemical Industries* shows that the ICI deputy chairman, on his recent visit to the U.S.A., revealed some plans of British chemical manufacturers which were said to have "left some of his audience slightly wide-eyed." Sir Frederick made effective use of one of the submissions presented in the recent ABCM report, which disclosed that expenditure for research by 272 British companies was likely to be raised from £8.5 million to about £11.5 million within the next year or two, which represented about the same ratio to sales totals as in the U.S.A. Recalling that until 1924 United Kingdom chemical exports to the U.S.A. exceeded imports, he traced the decline in this position to the point in 1948 when U.K. imports were worth some £9 million and exports to the U.S.A. only £2.5 million. Sir Frederick's expressed hope that that position is not to be permanent will doubtless be shared by all who appreciate how great may be the loss to both countries if a two-way traffic cannot be re-established.

Second "Safety" Conference

ON the heels of the report of the first (1948) conference on safety in chemical works, comes the full record of its successor, for which the Association of British Chemical Manufacturers and the Royal Society for the Prevention of Accidents were responsible, in Scarborough last October. The "Second Conference on Chemical Works Safety" will find a permanent place in many works libraries. This report helps to place in perspective the sources of danger associated with chemicals, making clear that it is in the user industries that risks are most rife. The need to educate users, which the conference chairman, Sir Harry Jephcott, stressed, is made only too apparent by reports of the various mishaps which occur in the use of chemicals. In one respect Dr. Amor's paper on the toxicity of organic solvents formed almost a corollary to Sir Harry's speech. Solvents are sold in increasing quantities to people who are not chemical manufacturers, and who may be quite ignorant of the dangers. The mass of relevant data which had been tabulated to form part of this paper should leave them in no doubt. The simple explanation of the medical points involved was certainly not the least important part of this treatment of the subject. The tabular matter may in time become out-of-date, but the explanation and guidance will long hold good. Mr. S. W. Richard's paper on electrical apparatus, reviewing the present recommendations and obligations regarding permissible electric equipment, points to the unsatisfactory obscurity, particularly with regard to dusts. Makers and users are placed in a state of uncertainty which urgently needs to be clarified. The full discussion and questioning suggests that the delegates agreed with that view.

New and Strange

THE ill-will which some shortsighted people bear towards scientists is generally supposed to have been engendered by the "A-bomb" and its monstrous relative in the hydrogen department. A more immediate cause of hard feelings is also perhaps the scientist's propensity for "monkeying about" with familiar objects so that they are not what they were (even if they are generally better) or, more disconcerting, not what they seem to be. A striking example of the latter sort was the synthetic ice-cream served recently to guests at Lowestoft, whose feelings on learning (after they had eaten it) that it was made principally of herring fat from which the taste had been removed and something from seaweed—possibly alginic acid—may not have been confined to admiration of the chemists who wrought this "sea change." Things stranger than that are, of course, being done with X-rays and neutron bombardment, which in Holland are said to be producing some surprising mutations in the height and foliage of tulips and gladioli. Gardening gloves and G-M counters may yet form a strange companionship in the potting shed.

SCIENTIFIC WRIT

(*continued from page* 526)

already been published. Shortly after the war, Professor R. O. Kapp gave at University College, London, a course of lectures which made so great an impression that it had to be repeated to accommodate the students and graduates who could not gain admission the first time. Later, these lectures became the basis of an admirable book, "The Presentation of Technical Information," (Constable, 1948). Two years later, however, it is not uncommon to meet scientific people who have not yet heard of this book, which could have afforded them a great deal of help in their various tasks of exposition.

Professor Kapp's book is not of the kind to give much help in the specialised art of making the abstruse clear enough for popular assimilation. It is significant that the Chemical Society and the RIC have admitted the need to do that more fully and are not unaware how difficult that undertaking can be. That more exacting form of presenting scientific facts as well as their implications represents another challenge to master the elusive art of good scientific reporting.

STREPTOMYCIN CLAIM

Dr. Waksman's Former Assistant

A SUIT to restrain Dr. Selman A. Waksman, of Rutgers University, U.S.A., from representing himself as the sole discoverer of streptomycin has been filed in the Superior Court of Trenton, New Jersey, by Albert Schatz, associate professor at Brooklyn College.

Dr. Schatz, reports *Chemical and Engineering News*, worked as a graduate student under Dr. Waksman and in 1945 was the joint applicant for the patent. In his complaint, Dr. Schatz states that he was persuaded under duress to agree to the assignment of the patent to the Rutgers' Research and Endowment Foundation.

U.S. university officials believe the case will set important precedents for future patent litigations arising out of discoveries in which graduates have collaborated, states the American periodical.

Counsel for Dr. Waksman and the Rutgers Foundation described as "baseless and preposterous" Schatz's charge that Waksman had been guilty of fraud and coercion.

"Dr. Schatz's work prior to the discovery of streptomycin covered a period of only a few months and was performed in the capacity of a carefully supervised laboratory assistant," counsel added.

British Styrene

BRITISH Petroleum Chemicals, Ltd. (jointly owned by the Anglo-Iranian Oil Co., Ltd., and the Distillers Co., Ltd.) and Monsanto Chemicals, Ltd., announce that they have formed a new company called Forth Chemicals, Ltd. This company will be concerned in the first instance with the manufacture of monomeric styrene required by the plastics industry.

British Petroleum Chemicals, Ltd., is at present constructing the petroleum chemicals plant at Grangemouth.

Monsanto is already producing polystyrene. For the monomeric form this country has had to depend on the U.S.A.

Belgian Scientists' Visit

Six Belgian scientists are at present touring British installations to study corrosion research, at the invitation of the British Iron and Steel Research Association. They will visit BISRA's exposure stations at Brixham and Derby, after visiting the corrosion section of the Chemical Research Laboratory.

NEW ATOMIC PLANT

Second Establishment in Berkshire

CONSTRUCTION work has been started at Aldermaston, near Reading, of a new atomic energy establishment. The Ministry of Supply, making the announcement, said that completion would take several years and a substantial labour force would be employed.

As in other atomic energy establishments, precautions would be taken to ensure that no harmful effect to the neighbourhood would arise. The site was a bomber airfield during the war and has since been occupied by the Ministry of Civil Aviation.

Stations already in existence are the research establishment, Harwell, Berkshire; a planning station, Risley, Lancashire; uranium processing plant, Springfields, Lancashire; production of fissile materials at Sellafield, Cumberland; and another under construction at Capenhurst, Cheshire.

It will be recalled that construction of one of the atomic piles at Sellafield was suspended last December (THE CHEMICAL AGE, *61*, 795), following the announcement by the Prime Minister, in October, that Government departments were to reduce their expenditure.

U.S. Specialists' Visit

MR. JOHN O. HARDESTY and Dr. Kenneth G. Clark, American fertiliser experts of the specialised division of the United States Department of Agriculture, are coming to the United Kingdom next week to study some departments of fertiliser industry in which technology here is considered to be in advance of American practice.

The visitors, from the Division of Fertiliser and Agricultural Lime, Beltsville, Maryland, will visit phosphatic and compound fertiliser factories in England and Scotland. They are interested in seeing, among other things, the latest developments in advanced granulating processes.

They will be entertained to luncheon in London by the Fertiliser Manufacturers' Association and the Superphosphate Manufacturers' Association on April 20, and by the Fertiliser Society on April 21. During the afternoon of the 21st they will present a short paper to the society on their work and their organisation. They will then start a very full tour which has been arranged for them by the Fertiliser Manufacturers' Association.

Basic Chemicals in January

Satisfactory Start to the Year

PRODUCTION and stocks of basic chemicals and non-ferrous metals in the first month of this year showed an improvement over the levels of January 1949. One exception was a large reduction in stocks of industrial alcohol. Production figures in almost all main categories showed increases on a substantial scale, sulphuric acid showing a rise of more than 11,000 tons. Consumption generally remained steady, but there were increases in the employment of compound fertilisers and liming materials.

Estimated numbers employed in the chemical and allied trades in January were slightly higher than in December, and with a total (in thousands) of 445.8 showed an increase of 15.7 over the total for January 1948. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 256.8 (188.1 men, 68.7 women); paints and varnishes, 38.2 (27.1 men, 11.1 women); oils, greases, glue, etc., 67.8 (54.3 men, 13.5 women); pharmaceuticals, toilet preparations, etc., 82.5 (42.5 men, 40.0 women).

The figures and the table given below are abstracted from the *Monthly Digest of Statistics*, No. 51.

	January, 1950 Thousand Tons			January, 1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	150.2	151.0*	—	139.0	136.0	—
Sulphur	—	28.8	71.6	—	24.6	71.4
Pyrites	—	19.0	71.0	—	19.5	57.0
Spent oxide	—	16.5	182.4	—	17.1	169.3
Molasses (cane and beet)	32.8	37.2†	259.7	44.1	24.1†	272.5
Industrial alcohol (mil. bulk gal.)	2.52	3.51	0.85	1.66	2.49	7.06
Ammonia	—	7.01	5.57	—	6.61	5.95
Superphosphate	18.5	23.1	—	18.9	20.8	—
Compound fertiliser	157.9	176.5	—	143.4	154.0	—
Liming materials	—	442.0	—	—	369.1	—
Nitrogen content of nitrogenous fertilisers	22.43	22.84	—	21.38	21.09	—
Phosphate rock	—	90.4	224.6	—	93.5	146.5
Virgin aluminium	2.52	15.0	—	2.50	17.1	—
Virgin copper	—	27.7	130.2	—	29.8	115.3
Virgin Zinc	5.61	19.2	54.1	5.08	17.1	39.9
Refined lead	5.32	14.8	60.1	4.29	13.3	24.5
Tin	2.89*	2.30	22.1*	3.18*	2.05	19.2*
Zinc concentrates	—	14.1*	65.5*	—	12.7*	30.3*
Magnesium	0.51	0.48	—	0.52	0.61	—
Pig iron	187.0	142.0	541.0	178.0	135.0	278.0
Steel ingots and castings (including alloys)	305.0	—	1,263.0	289.0	—	1,019.0
Rubber: Reclaimed	0.48‡	.048‡	2.29‡	0.35‡	0.35‡	4.27‡
Natural (including latex)	—	4.25‡	40.0‡	—	5.52‡	44.8‡
Synthetic	—	0.05‡	1.12‡	—	0.04‡	1.97‡

* December. † Distilling only. ‡ Average of five weeks.

English Lead Prospect : Reviving An Ancient Industry

DEVELOPMENT of the deep lead-ore deposits in Derbyshire has been sanctioned by the Ministry of Town and Country Planning and prospecting is to be carried out on land owned by the Derbyshire Stone Co. in the neighbourhood of Wirksworth and Matlock.

The rise in lead prices during the last 10 years has resulted in a number of efforts to revive the industry, and the present survey would be carried out by the Johannesburg Consolidated Investment Co.

Towards the end of 1948 the Barmote Court upheld the right of a workman to work a vein in a limestone quarry near Wirksworth, which, it was stated, yielded him and his colleagues more than £1000 during the year.

Lead mining is a very ancient industry in Derbyshire. There are estimated to be some 4000 odd workings in the Wirksworth area presided over by the Barmote Court which has judged claims since mediaeval times.

One difficulty of mining the lead in the Derbyshire hills has been the high water table, but it is hoped that the present project will be able to overcome this by modern methods of deep mining.

MODERN NITRIC ACID PLANT

High Pressure and Yields of Dutch System

From Our ROTTERDAM CORRESPONDENT

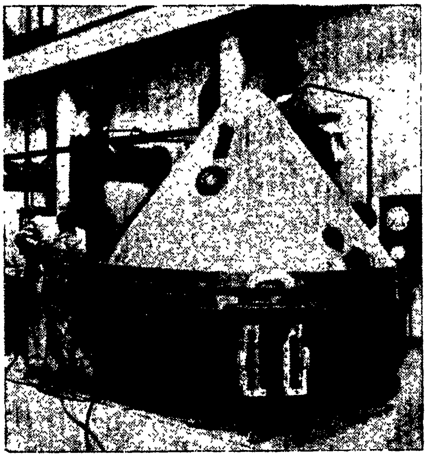
THE third plant for the manufacture of nitric acid, owned by the Dutch State coalmines and erected at Geelen (Limbourg province), is reported to have a capacity of about 320 tons of 55 per cent nitric acid, or 100 tons of nitrogen daily. It consists of three units of equal capacity, all of which will shortly be in operation.

The design was based on some of the organisation's own inventions and experience gained in operating the other two nitric acid plants. In one of these the nitric gases are absorbed under atmospheric pressure, with periodical refilling in a granite tower, and in the other absorption is achieved in horizontal Fauser cylinders.

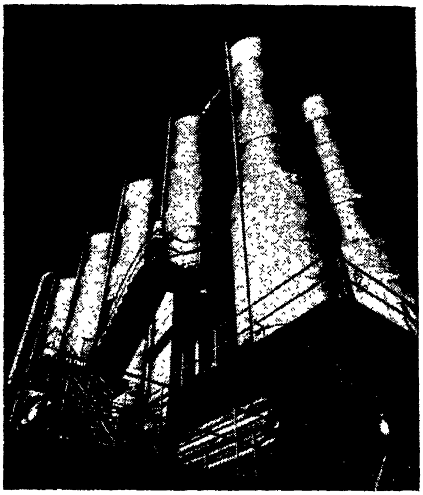
Larger Mesh Catalysts

The distinctive features of the new unit are the increased pressure under which absorption takes place, and the enlarged diameter of the heated platinum-rhodium mesh, through which the mixture of ammonia and air is passed. This method secures a satisfactory "burning" yield. Also of interest are the designs of the acid and gas cooling apparatus, by which relatively little special steel is required.

The burnt gases are first subjected to a cooling process in La Mont type boilers and then pass to hot gas coolers. A large steam output is thus achieved. The gases thereafter are compressed to 3 atm. in rotating compressors and once more cooled and led into the absorptive system through an oxidation tower.



Igniting one of the burners placed on top of a waste heat boiler



The absorption tower system for one unit having a capacity of 34 tons of nitrogen a day

The absorptive system consists of a number of stainless steel towers provided with Raschig rings. The yield is so large as to afford a total percentage of about 95 (including burnt NH_3). It is then possible to produce nitric acid of 55 to 60 per cent concentration.

The residual gases of the system are carried away by expansion turbines.

The total energy consumption by the new unit for nitric acid (including that of acid pumps, cooling water pumps, etc.) amounts to 9000 kWh per ton of nitrogen produced.

New Dutch Chemical Works

Bataafsche Petroleum Mij., an important subsidiary of the Royal Dutch Shell group, has opened its chemical factory at Pernis (Holland) to produce synthetic detergents and polyvinyl chloride products.

Parliamentary Topics

PROBLEMS of industrial dermatitis were raised last week by Dr. Barnett Stross, who asked the Minister of National Insurance how many were suffering from this disability, what was the average time lost from work, payment of claims and provision of adequate dermatological certification. Dr. Edith Summerskill stated that it was hoped to publish later in the year full information on the incidence of the disease in different areas, claims for injury and disablement and assessments made for loss of faculty. With regard to diagnosis of dermatitis, the Minister said that it was often of obscure origin, so that it was difficult to arrive at a correct prognosis. There was, unfortunately, a shortage of dermatologists.

THE number of persons due for National Service who had accepted employment as chemists under the Ministry of Supply and the inadequacy of the basic salary offered —£230 per annum—were the subjects of questions by Mr. Stanley Prescott to the Minister of Labour. Mr. G. Isaacs said 42 men who left the Universities in 1949 had accepted such posts, while 24 had declined. The basic salary offered was £312 per annum, and not the sum mentioned.

IN a written answer to Mr. Emrys Roberts regarding the composition and powers of the Monopolies and Restrictive Practices Commission, Mr. A. G. Bottomley stated that before considering any changes it was proposed to await the reports on its first investigations. There was no reason to doubt that the commission's existing powers were sufficient to enable it to obtain all the information required.

TO overcome the shortage of factory inspectors, two open competitions will be held this year and the age for recruiting is being lowered from 23 to 21 so that younger graduates can become candidates —Mr. George Isaacs.

IN reply to a question from Mr. J. Grimston, concerning the number of staff in the Scientific Adviser's Division of the Ministry of Food, Mr. Maurice Webb said that the total was 58 compared with 16 five years ago. The figures, however. were not strictly comparable as much of the work now being done under the direction of the Chief Scientific Adviser, was in 1945 being carried out in other divisions of the Ministry.

ASSURANCES that the minute quantity of iodine proposed to be used in salt would not have any adverse affects even to persons allergic to iodine were given by the Minister of Health in reply to questions from Sir Hugh Lucas-Tooth and Mr. Langford-Holt.

REPLYING to a question by Mr. John Grimston about the importation of streptomycin, the Minister of Health stated that no licences were being issued as British supplies were adequate for all home requirements and there was a margin for export.

MR. A. R. HURD asked the Minister of Agriculture if the expected supplies of artificial fertilisers, particularly of potash, were being received from Palestine, Germany, and France. Mr. G. Brown said that favourable weather had created a brisk demand, but expected supplies were being received and were larger than last season. Had the farmers taken heed of the advice to take early delivery of potash, the present shortage would probably not have arisen.

Chemical Engineering Study

WELCOME evidence of increased recognition of chemical engineering as a course of study for the B.Sc. and other degrees is contained in the current issue of the quarterly bulletin of the Institution of Chemical Engineers.

The University of London Inspector has approved the course of study at Bradford Technical College in chemical engineering, leading to the external degree of London University in that subject, and has recommended that the college be recognised for the external degree of B.Sc. (Eng.) in chemical engineering.

Arrangements to include chemical engineering in the endorsement of National Certificates in chemistry and applied chemistry have been made as a result of negotiations between the Institution, the Ministry of Education, and the RIC.

The Principal of the Municipal College at Burnley wishes to develop a preliminary course in chemical engineering.

Freedom for Steel Industry

U.S. Determination to Retain Independence

THE view that the British Government, through its control of certain materials, has strangled the growth of some industries and promoted others according to its political ideology, was offered recently as an indication of the dangers besetting American steel industry. It was the central theme of an address by Wilfred Sykes, chairman of the executive committee of the (U.S.) Inland Steel Company, published in *Midwest Engineer* (2, No. 7, 3-7).

Through controls, Mr. Sykes believes that the U.S. industry could become a political pawn, with its freedom to develop destroyed. Only degeneration could be the result. The existence of Government-subsidised plants, with low overheads and no responsibility to make profits to attract capital investment, would be disastrous.

Forcing Nationalisation

The building of plants with Government funds and the arbitrary fixing of prices would destroy private enterprise and eventually strangle it, leaving the owners no alternative but to liquidate or sell to the Government. This would bring about nationalisation.

Citing the competitive spirit of free enterprise in the U.S. industry, which has required that every company should take advantage of new developments, this, claims Mr. Sykes, has lowered production costs, improved quality and increased output.

Some American politicians had thought that non-competitive methods, or an approach to the cartel system, would better achieve stability and prosperity. The attempt to establish such a system in 1934 had been a miserable failure.

As a result of the rapid expansion and development under a free competitive system, people from all over the world were going to the U.S.A. to purchase equipment and study production methods and, where possible, to acquire the "know how" developed there.

The rehabilitation of the steel industry in Western Europe was dependent almost entirely on U.S. equipment and knowledge.

The U.S. industry, said Mr. Sykes, produced about one-half of the world's steel and had reached a capacity of 100 million tons of ingots annually. It was estimated that in 1950 the steel industry would spend about $500 million provided from its own resources.

There had been some rather ill-founded speculation on the future of the steel industry, and it was suggested that the sources of domestic ores were being depleted so rapidly that large imports of foreign ores would soon be needed.

This, Mr. Sykes said, was not a true picture: the nation's resources were not sufficiently reduced to cause immediate concern. Improvements in the equipment and methods of removing the overburden from the ore body had allowed many properties, previously considered as underground mines, to be exploited by open pit operations.

About 85 per cent of the U.S.A.'s ore requirement was obtained at present from the Messaba Range. Extraction of ores there had been largely compensated by the discovery of new ore and the reclassification as ore of material previously considered to be of too low a grade.

The best estimates available showed that the U.S.A. would have a supply in the Messaba Range that would last about 30 years, after which the annual production would gradually decrease.

There were many other districts remaining to be exploited. It would seem that there was ample ore in sight to enable the steel industry to operate for, probably, hundreds of years, without dislocation.

Changing Metal Prices

THE price of zinc was increased on April 4 by £2 per ton delivered. Good ordinary brand zinc became £91 10s. per ton, and prices of other grades were varied accordingly. The zinc oxide manufacturers also announced that from the same date the prices of zinc oxide, in lots of not less than two tons, delivered, were increased by £1 15s. per ton. Red seal becomes £87 10s. per ton; green seal £89, and white seal £90.

The additional charges made on orders placed with the Director of Non-Ferrous Metals for forward delivery of copper, lead and zinc have, as from April 4, been reduced as follows:—

Second and third calendar months after month of order: Copper per ton £1 10s. (previously £2 10s.); lead per ton £1 (£2); zinc per ton £1 (£2). Fourth, fifth and sixth calendar months after month of order: Copper per ton £3 (previously £5); lead per ton £2 (£4); zinc per ton £2 (£4).

New Acetylating Agent

Useful Potentialities of Isopropenyl Acetate

ISOPROPENYL acetate is a new chemical of great potential value in a number of syntheses. Characteristic examples are acetylation, in which the mild and easily controlled conditions associated with this reaction recommend the reagent's use with many compounds otherwise difficult to acetylate; reaction with alcohols and amines to form new esters or amides; reaction with acids to produce anhydrides of unsaturated and aromatic acids and polymerisation to form either low molecular weight, viscous liquids or when co-polymerised with other monomeric compounds, solid polymers.

The acetate is prepared commercially by the reaction of ketone with acetone in the presence of an acid catalyst. This reaction is reversible and the original components may be readily obtained under the influence of heat and a suitable catalyst.

Source of Monomers

Isopropenyl acetate is a water-white liquid, specific gravity 0.9202 and boiling point (748 mm.) 96.6° C. Flash point is 14.5° C. (58.1° F.). Normally the commercial grade, as manufactured in America, has an ester content of approximately 98-100 per cent.

The most valuable property of this new industrial chemical is its ability to act as acetylating agent. Thus, from acetaldehyde and paraldehyde it is possible to prepare vinyl acetate; from crotonaldehyde, 1-acetoxy-1, 3-butadiene; from ethacrolein the monomeric substance 1-acetoxyisoprene and from acetophenone, a-acetoxystyrene. These are all polymerisable monomers which may be converted into commercially useful polymers.

Isopropenyl acetate is particularly useful in the acetylation of compounds such as hydroxy esters and nitriles, tentiary alcohols and other molecules which have a tendency to dehydrate in the presence of acetic anhydride. Suitable esterification catalysts include sulphuric acid and p-toluene sulphuric acid (0.1-0.5 per cent).

Interesting isopropenyl esters can be obtained when the acetate reacts with carboxylic acids in the presence of ester interchange catalysts such as mixtures of mercuric acetate and boron trifluoride ether complexes. Halogenation is carried out quite readily and compounds such as a. β-dihalopropyl acetates can be formed provided the reaction is carried out at reduced temperatures, preferably 0° C.

The polymerisation of isopropenyl acetate may be considered under three main headings.

First in the presence of peroxide catalysts, such as benzoyl peroxide, isopropenyl acetate can be polymerised to form low molecular weight, viscous liquids.

Secondly, when copolymerised with other vinyl compounds, e.g., vinyl chloride, isopropenyl acetate will form solid copolymers which are of interest for making films and synthetic fibres. The copolymer formed from vinyl chloride and isopropenyl acetate so as to contain up to 32 per cent of the acetate is one of the most useful of the new copolymers.

Finally, copolymers may be formed by reacting isopropenyl acetate with esters of maleic and fumaric acids to yield clear, colourless resins, some of which are suitable for making cast sheeting of excellent optical properties. From these copolymers it is also possible to make bead compounds suitable for moulding.

Mixed Vegetable Oil Imports

THE Ministry of Food, in consultation with the Board of Trade, has drawn attention to the fact that while imports of certain vegetable oils, including teaseed oil, are at present admitted under open general licence from selected countries, there have been recent instances of imports of oil described as "teaseed oil" which on analysis has been found to contain an admixture of other oils, such as groundnut oil, coconut oil, palm oil, or palm kernel oil. Such mixtures are not covered by the open general licence and are subject to restrictions on sale under the Oils and Fats (No. 2) Order, 1949.

Hitherto the Ministry of Food has given authority for shipments of mixed oil imported in good faith as teaseed oil to be disposed of through ordinary commercial channels. The Ministry now announces that such authority will not be granted for any future imports and that arrangements are being made to verify that goods entered as teaseed oil fully conform to that description.

MONOMERIC ACRYLIC ESTERS

Their Use in Leather Processing and Finishing

THERE are now several monomeric esters of acrylic and methacrylic acids available in commercial quantities, the most important being methyl acrylate, ethyl acrylate *n*-butyl acrylate, methyl methacrylate and *n*-butyl methacrylate. These are becoming of interest to the tanner as filling agents and for the primary or bottom finishing of upper leather, bag leather and upholstery.

There are many advantages offered by these acrylic esters over other monomeric compounds, notably those based on urea, melamine, phenol, resorcinol, etc. For example, the monomers are colourless liquids, capable of being polymerised into clear resins. They can be polymerised without diluents or with diluents in a homogeneous system. In addition, polymerisation may be carried out in a heterogeneous system, or by emulsion and suspension polymerisation.

Co-Polymers

Types and conditions of polymerisation influence the properties of the polymer: for example, polyethyl acrylate can vary in molecular weight from 2200 to a weight that is too high to determine. Apart from the straight polymeric esters, a large number of co-polymers can be prepared. The monomeric esters are convenient to handle and may be obtained as inhibited liquids which, on using excess catalyst , can be converted into polymers.

Polymerisation takes place very rapidly in the presence of catalysts, such as benzoyl peroxide, ultra-violet light and heat. Above 5°C. the monomers soon begin to polymerise in ordinary daylight. The esters are soluble in a wide range of solvents, including benzene, butyl acrylate, methanol, dioxane, acetone, ethylene dichloride, toluene, etc., solubilities varying from ester to ester.

There are, of course, certain disadvantages attached to the application of esters, and these should be known by the tanner. They are expensive when compared with most other monomeric substances. They have low flash and fire points and are highly inflammable, so that the use of adequate ventilation and the elimination of open flames, static electricity, and other possible sources of sparks or flames is essential.

The esters are toxic and need to be handled with care, although the polymers themselves are quite innocuous. They possess a sweet, sickly, but not unpleasant smell.

The esters are of main interest to the tanner on account of their ability to be changed into polymers, many of which are tough and elastic compounds. Extra weight can be given to several types of leather; water resistance may be improved and broken grain or disfigured surfaces masked by a layer of the polymerised resin.

So far, little commercial use has been found for the acrylic monomers, but even a casual consideration of their potentialities will indicate that they have a wide field of usefulness, both in the processing of leather prior to finishing and in the actual finishing operation.

One method which is suggested for treating chrome goods is to drum the dyed and dried stock in an emulsion of ethyl acrylate containing 5 per cent of the ester, using the minimum quantity of liquid. After 10 minutes' processing the leather should have absorbed all the monomer and the skins can then be taken out, horsed up for 12 hours and then dried.

Generally, polymerisation is fully completed during drying which, for chrome leather, can be carried out at advanced temperatures. Ethyl acrylate is suggested because it gives a tough and fairly elastic polymer, but there are, of course, several other esters, including some which are only available in experimental quantities, *e.g.*, cyclohexyl acrylate, isobutyl acrylate, etc.

The Stuffing Process

Some interesting results can be obtained by adding acrylic esters to the oleaginous mixtures used for stuffing chrome kips and hides. The addition of 2-5 per cent of monomer on the weight of the dry leather will make possible a worthwhile increase in resistance of the finished leather to the penetration of water, and also an increase in weight.

The monomeric esters can be sprayed on to the dry leather prior to finishing, and this practice offers some advantages over the more usual method of spraying with solvent solutions of the polymers. Greater penetration of monomer can be effected, which is important where the grain is damaged and there is a need to provide a really tenacious bottom or primary finish.

SCOPE OF THE NEW DETERGENTS

Surface-Active Agents and Germicides

by NORMAN J. HARPER, M.Sc., A.R.I.C., Ph.C. (N. Ireland)*

SURFACE-ACTIVE agents are, as a rule, characterised by a molecular structure which is essentially linear. The most important feature is the large hydrophobic or non-polar group in the molecule, usually in the form of a long hydrocarbon chain, but sometimes as a hydrocarbon ring or system of rings, and attached to this a hydrophilic or polar group, such as a carboxylate, hydroxyl, sulphonate, or sulphuric ester group which confers water solubility on the compound. If the soluble group in detergents is towards the end of the hydrophobic group the product acts best.

Molecular Behaviour

Soaps are the simplest examples of surface-active agents, employing the principles exemplified by sodium stearate $C_{17}H_{35}COONa$. The hdrocarbon chain ($C_{17}H_{35}$) represents the hydrophobic part, and the ($COONa$) the hydrophilic portion of the molecule.

Molecules of this type orient themselves at the surface of the solution and also at the interphase between a soap solution and an immiscible liquid. The soluble water-attracting group stays in the water surface while the hydrocarbon chain tries to move out of the water surface and into the oil or other immiscible liquid. This results in a reduction of surface tension in the first instance, and a reduction of inter-facial tension in the second.

Another important property associated with surface-active agents is the effect of solubilisation, or the carrying of normally insoluble substances into thermodynamically stable solution. This is dependent upon the presence of colloidal micelles in the interior of the solution and is essentially a bulk property of the solution system, whereas the alteration of surface tension is fundamentally a surface property.

Surface-active agents are noteworthy for typical effects, usually called gross effects, which cannot readily be measured or expressed in terms of basic physical units. Such effects are: wetting, foaming, deflocculation or dispersion, emulsification and detergency.

The electrical charge on the hydrophobic group serves as a convenient basis for the classification of detergents; on the nature of this charge, or the absence of ionisation, detergents have been classified as: anionic, cationic, and non-ionic.

If the long hydrocarbon chain or hydrophobic portion of the molecule is included in the anion in aqueous solution, the substance is called anion-active or anionic, for example, sodium stearate:

$$C_{17}H_{35}COONa \rightleftharpoons C_{17}H_{35}COO^- + Na^+$$

In the cationic or cation-active type, the cation contains the hydrophobic portion of the molecule, for example, cetylpyridinium chloride.

$$(C_{16}H_{33}\underset{CH:CH}{N:CHCH:CH})Cl$$

The fatty esters of glycol and glycerol $C_{17}H_{33}COO—CH_2$, $HO—CH$, $HO—CH_2$ were the earliest non-ionic surface-active agents, for example, glycerol mono-oleate. More soluble non-ionic esters and ethers were obtained by condensing polymerised ethylene oxide with fatty alcohols or with substituted phenols.

The remarkable growth in the use of synthetic surface-active agents, including detergents, wetting agents, and emulsifying agents, can be best illustrated by the production figures in America, where production jumped from 6000 tons in 1941 to 200,000 tons in 1947; the estimated production for 1950 is some 500,000 tons. Textiles, engineering, food, leather, paper, paint, and brewing are a few of the other industries in which these compounds are used.

Clinical Value

Many of the pharmaceutical applications of detergents depend upon germicidal effect. This naturally varies from product to product, and seems to have only a limited relationship to the usual surface-active and gross properties. Detergents may be used themselves as germicides, or they may be employed as solubilising, emulsifying, or carrying media, for other germicidal compounds. For the last purpose, the detergent may be inert, or it may act as a synergist for the active ingredient, by increasing its germ-killing activity.

In some combinations the surface-active agent may reduce the potency of the active agent and these, of course, should be avoided; for example, an anionic detergent should never be used in combination with a cationic germicide.

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* Condensed from a paper presented before the Pharmaceutical Society in Edinburgh on March 15.

Micro-organisms vary greatly in their resistance to the surface-active agents, and it has been shown that the established methods of testing non-surface active germicides do not always give accurate results when applied to the surface-active compounds. For this reason the broad claims of the germicidal activity made for some of these compounds must be carefully checked. The evaluation of surface-active germicides is still a very controversial topic.

Of those detergents which are in themselves destructive to micro-organisms, the most potent are the cationic, more particularly the quarternary ammonium compounds. Their high potency and usefulness was first pointed out by Domagk in 1925. Since then hundreds of new "quats" have been synthesised and their use as germicides or fungicides disclosed.

Among those which have been most widely accepted are the alkylpyridinium halides and the alkyltrimethylammonium halides, in both of which the cetyl radical is said to give optimum results. Domagk found that excellent results were obtained when a wide variety of hydrophobic groups were combined with the dimethylbenzyl ammonium group; the presence of this characterises several other successful and widely used compounds.

Within limited series of the "quats", many attempts have been made to correlate chemical structure and detergency and other surface effects with germicidal activity. None, however, has as yet brought forth any correlation of wide scope.

Antibacterial Effects

The "quats" meet many of the requirements of the ideal disinfectant. Most of them, marketed as germicides, sanitisers, or disinfectants, are relatively free of colour. and are odourless and tasteless in the dilutions normally employed. They are soluble in water and in a variety of organic solvents, and, as a rule, are relatively non-corrosive. As a group they are active in rather high dilution, exhibiting a high antibacterial power against both gram-positive and gram-negative organisms.

Laboratory results have shown that CTAB in 0.08 per cent concentration is sufficient to kill rapidly virulent strains of *Staphyloccocus aureus* and *Streptoccocus pyogenes* in the absence of organic matter. *Bact. coli* and *Ps. pyocyanea* organisms are also quickly killed under the same conditions. All are susceptible to a 0.1 per cent solution, even in the presence of moderate amounts of organic matter. Bacterial spores are more resistant.

Factors which influence germicidal activity are *p*H, temperature, concentration, and the presence of organic matter. The "quats" are considerably more active in neutral, especially alkaline solution, than in acid solution. Mueller and Baker stated that the effectiveness of the cationic compounds increased progressively as the *p*H shifted towards the alkaline side of neutrality—this is in contrast to the anionic compounds which show their maximum activity on the acid side. It has been shown, however, by Quisno and Foter that cetylpyridinium chloride is exceptional in that its maximum activity is shown in acid solution.

Toxicity

In the concentrations used, the "quats" are, generally, considered to be non-toxic. They do not interfere with the healing processes, nor do they cause irritation. In a very small number of cases, sensitivity to some of these compounds has been reported. Reports are now becoming available on the use of these compounds in medicine over prolonged periods.

Wright *et al.* described the use of an alkyldimethylbenzyl ammonium type in connection with amputations, abdominal and other surgical conditions, and burns. The substance was found to be without toxic effect when used on large denuded surfaces, nor did it cause discomfort to the patients. Clarke used patch and scratch tests on 600 patients with a 1-200 tincture and aqueous solution of cetylpyridinium chloride. There were no reactions.

In medicine, the main use of these compounds has been the sterilisation of surgeons' hands in gloveless surgery, in obstetrics, in securing a sterile operative field. They have also proved useful in wound and burn therapy.

Their combined detergent and bactericidal properties make them particularly useful for the routine cleaning of hospital equipment—in all those cases where it is desirable to cut down the risk of cross-infection. To obtain the desired detergent effect more concentrated solutions have to be used.

The choice of preservatives in pharmaceutical preparations is frequently a problem and it is possible that the answer may be the "quats". Their possible use has been investigated by determining their minimal effective concentration to prevent growth in different proportions of gelatin and sucrose. Although inconsistencies in the results have prevented definite conclusions from being made, it is considered that those obtained merit further investigations.

Although the cationic agents received

much wider acclaim, there are also effective germicides among the various classes of anionic detergents. The fatty alkyl sulphates have been most widely studied, and the straight chain compounds of C_{12}—C_{16} have been found to be effective against gram-positive bacteria, but much less so against gram-negative types.

Sodium lauryl sulphate has been suggested as a basis for disinfectants. Some secondary alkyl sulphates are said to possess excellent bactericidal powers, as do also the long chain alkyl aromatic sulphonates.

Use in Cosmetics

Non-emulsified lotions often contain detergents such as sodium lauryl sulphate or triethanolamine to facilitate their spreading on the skin. Lotions containing solid materials in suspension, such as calamine or sulphur, often contain a detergent to help in maintaining the suspension.

The shampoo preparations form one of the main outlets for synthetic detergents, in spite of the fact that the soap type of shampoo is still the most widely used. One of the main disadvantages of the soap shampoo is the lack of resistance to hard water.

The shampoos formulated with synthetic detergents are of two main types—foamless and foaming; the latter is by far the more important. The foamless type is, essentially, a low-sulphonated vegetable oil, usually prepared from castor oil or oils containing oleic glycerides.

Many synthetic detergents have been suggested and used as foaming shampoos, but relatively few have attained a high degree of "acceptancy". To be successful they had to have good solubility, had to produce the desired type of foam, and had to be free of " harshening " or irritating effects.

There has been considerable controversy over the harmful effects of soap on the skin, and, although in the majority of cases, no sensitivity occurs, it is evident that the relatively high *p*H does bring this about in certain cases, in which, detergents such as sulphonated oils, sulphated higher fatty alcohols, have been successfully used as personal cleaners.

Detergents have been added to soap to improve its efficiency. Development in this direction was stimulated by the war, when it became necessary to supply the Armed Forces with large quantities of personal cleaners which could be used with salt or hard water. In America and in the U.K. large quantities of detergents were used for compounding with fatty-acid soaps to produce the so-called "general purpose soap", of which, in the U.K. alone, 48 million bars were prepared and supplied to the Forces.

U.S. Engineers to Review New Processing Factors

TWO relatively new engineering processes will be the subjects of symposia to be presented at the Boston regional meeting of the American Institute of Chemical Engineers, at Swampscott, Massachusetts, from May 28-31.

The symposium on ultrasonics, under the supervision of Prof. Dudley Thompson, Virginia Polytechnic Institute, will explore the potentialities and limitations of this comparatively new tool of science.

Papers will deal with fundamental principles of ultrasonics; chemical, physical, and colloidal effects produced by ultrasonics; and the industrial utilisation of ultrasonic energy. The use of ultrasonics in the study of matter and as a method of material testing will also be considered.

Prof. E. R. Gilliland, of Massachusetts Institute of Technology, will preside at the symposium on fluidisation, the purpose of which is to emphasise the chemical reaction aspects of the fluidised powder process, rather than the physical characteristics of the operation. Papers will deal with diffusion rates in porous solids, principally catalyst materials; experimental results of the flow of gas and solid in a commercial catalytic cracking unit; and the mechanism of reaction in fluidised powder systems.

There will also be a general technical session in which will be considered the extraction of cobaltous chloride in capryl alcohol spray towers, and a study of an ion-exchange system. The U.S. potash industry will be discussed.

Problems of engineering design will be discussed in papers describing a continuous, small-scale plant for the study of catalytic reactions at high pressure and temperature, a new graphical technique for PVT correlation, and an analysis of the treatment of temperature differences in split-flow heat exchangers.

The education of chemical engineers for industry is to be discussed by Prof. W. G. Whitman, of M.I.T.

THE ALKALINE EARTH PLUMBATES

Their Potential Use as Anti-Corrosion Paint Pigments

THE majority of the less soluble compounds of lead have at some time been used as pigments. In addition to the classical white and red lead, the sulphates, chlorides, fluorides, chromates, antimonates, silicates and other compounds have all proved their value in paint. Although the plumbates of the alkaline earth metals are lead compounds, their chemical composition makes them different from other lead pigments.

The importance of the alkaline earth plumbates as paint pigments to assist in the conservation of a valuable and still comparatively costly raw material—lead—is stressed by Mr. N. J. Read *(Goodlass Wall and Lead Industries, Ltd.) in this paper. It was one of those recently presented before the London section of the Oil and Colour Chemists' Association*

In the common lead pigments the cation consists entirely of lead, whereas in the alkaline earth plumbates the lead is found only in the anion. Experiments appear to show that the presence of alkaline earths as cations in compounds of the plumbate type opens up a new field of investigation in paints for the protection of iron and steel.

When the necessity for economy in the use of lead became obvious, an investigation was commenced with the object of developing a rust inhibitive pigment which would economise lead and give protection similar to that afforded by red lead.

The similarity between the chemical structure of red lead or lead ortho-plumbate and the plumbates of the alkaline earths is immediately noticeable from their chemical formulæ—respectively red lead 2 PbO PbO_2, and alkaline earth plumbate 2 RO PbO_2. Having in mind the rust inhibitive effect of red lead and the believed relationship of its basicity to inhibitive power, it is thought that the greater basicity of the alkaline earth compounds may provide anodic inhibition even superior to that of red lead.

It has been shown that the type of inhibition conferred by the alkaline earth plumbates is not solely anodic, but also cathodic, and in that characteristic they differ from other rust inhibitive pigments. The only alkaline earth plumbates of pigmentary interest are the anhydrous compounds prepared by heating mixtures of lead monoxide and alkaline earth oxides or carbonates under controlled conditions in air.

A number of hydrated plumbates have been studied, but those compounds have no pigmentary value, being too reactive with oil vehicles for use in paints, and having other disadvantages.

The Ortho-Plumbates

The alkaline earth ortho-plumbates were studied by Kassner between 1894 and 1898. He has described a method of preparation and some of their properties and has obtained patents for their use as sources of oxygen, in match making and in glass manufacture, etc. Since the publication of Kassner's work, however, the ortho-plumbates do not appear to have attracted further attention, and hitherto no attempt has been made to utilise them as paint pigments.

In a recent series of experiments in which intimate mixtures of litharge, and respectively lime and strontium and barium carbonates, in proportions of one molecular equivalent of lead oxide to two molecular equivalents of the base, were heated under controlled conditions, the rate of oxidation was followed by determination of the lead peroxide contents at intervals.

It was found that the temperature range given by Kassner, of 600-1000°C., was appropriate to all the mixtures, but at 600°C. the interaction was very slow after a certain proportion of plumbate had been formed. The oxidation curves were of the same type as were obtained in red lead preparation, but the decomposition temperatures of the alkaline earth plumbates being further removed from the formation temperature than was the case with red lead, there was little danger of operating at too high a temperature.

Low Temperature Operation

On the other hand, for manufacturing convenience, and also in order to produce as soft a powder as possible, it is desirable to operate at as low a temperature as is practicable.

For calcium plumbate the optimum temperature is about 700°C. Strontium and barium plumbates require rather higher temperatures. For barium plumbate the temperature is of the order of 800° C. In the case of calcium plumbate it is found that 1-ton charges in a works furnace oxidise at the same rate as the small laboratory charges. The avidity with which the lime/lead oxide mixtures absorb oxygen at 700° C. is remarkable.

The brown and black colours of the strontium and barium plumbates call for no further comment, but the colour of the calcium compound has been found to be variable at will.

Colour of Calcium Compounds

Apart from the effect of impurities in commercial lime, which impart a creamy tint to the lightest form, it may vary from white to dark reddish buff, depending on very small variations in the proportions of lime and lead oxide used in the mixtures from which it is prepared. Those variations in colour could not be imitated by mechanical mixtures of litharge and calcium plumbate; it seems reasonable to assume therefore that any excess of lead is in the chemical combination of the plumbate, conceivably as lead calcium plumbate, which is said to be red brown.

If a chemically pure source of calcium oxide, such as precipitated calcium carbonate, is used in slight excess in the preparation of calcium plumbate, a white product is obtainable. Alternatively, the addition of a small amount of ground quartz instead of the use of an excess of calcium carbonate also produces a white plumbate; probably the silica preferentially combines with any surplus lead oxide. The PbO_2 contents of those white products indicate that they were at least 99 per cent $Ca_2 PbO_4$.

Preliminary experiments show that all the plumbates described have possibilities as paint pigments. They are substantially insoluble in water and easily dispersed in oil vehicles to form stable paints of high opacity.

Calcium Plumbate

Calcium plumbate has an attractive appearance and requires little, if any, grinding after furnacing, and although the lead content is higher than that of either strontium or barium plumbate, it has a lower specific gravity, and the lead used in paint formulations is no higher.

The BSI test is not applicable to calcium plumbate, and *p*H determinations on the aqueous extract are without the usual significance.

On extraction with cold water it yields about 0.5 per cent of soluble matter, essentially calcium hydroxide. Dry paint extracted with water by a method described by Cushman and Gardner yielded 0.1-0.2 per cent of soluble matter per 100 gr. of pigment present in the paint. That small but continuous supply of alkaline water-soluble material at the iron/paint interface has no deleterious effect on the paint film; indeed, to it is attributed to a significant degree the high rust inhibitive power of calcium plumbate paint.

There are some unusual features in the behaviour of calcium plumbate as a rust inhibitor which indicate that it functions differently from the rust inhibitive pigments in common use. If the assumption that calcium plumbate is a general inhibitor for anodic and cathodic areas is correct, it follows that a paint containing this should exhibit resistance to blistering on immersion in sea water, absence of pitting, and resistance to creep of rust under the film when abrasions exposed the metal and formed accidental anodes.

Exposure trials of calcium plumbate paint have shown that it exhibited all the properties which might be forecast from its assumed electrochemical behaviour. Those properties, however, form only part of the requirements of a paint pigment.

Sea Water Immersion Tests

The chlorinated rubber paints in salt water immersion tests show a colour change of the pigment, but the protection afforded is good. It has been found that the best inhibitive effects of calcium plumbate are obtained in sea water immersion in simple linseed oil or polymerised vegetable oil vehicles.

With the more complex vehicles, in certain conditions the inhibiting agent does not appear to reach the metal/paint interface in sufficient concentration, and blistering is not prevented to the maximum extent, although rusting is not markedly increased. Similar observations have been recorded by other workers in the case of red lead paints.

Due to the powerful rust inhibitive effect of calcium plumbate and the toughening influence it exerts on the paint film, paints of high protective value can be formulated with large amounts of inert extenders. In fact, over rusty iron even better results have been obtained in sea water immersion tests with paints in which the pigment has been extended with 50 per cent of barytes and asbestine than with the unextended pigment.

The light colour of calcium plumbate permits its use in a variety of tinted paints. Grey, green and brown paints have been prepared. Experience has not shown that the basic character of the pigment effects the colour of some of the alkali-sensitive pigments. Very light tints of Prussian blue, both in mixture with calcium plumbate and painted over calcium plumbate, have withstood long exposure in a C.C.I. humidity cabinet without marked change in colour. A few exposure trials on timber have been made, with very promising results.

The use of calcium plumbate paint on galvanised iron indicates that it can be used direct on new galvanised iron which has not been previously treated, and that it does not crack or flake.

Opening the discussion which followed, the chairman, Mr. H. A. Newnham, commented that his first impression on hearing the paper was that the sale of red lead and zinc chrome would cease, that with the barium and strontium and calcium plumbates we should be able to make red, black and white paints, and the whole trade would have a difficult time in competing. One felt that there must be some limitations to the materials, although it seemed from the paper that they possessed most of the properties required in pigments for primers and finishing paints.

Novel Pigments

Mr. Read said he hoped he had not given the impression that calcium plumbate paint was super-perfect. No doubt all sorts of disadvantages would crop up; but the pigments were novel, because possibly the effect of calcium and lead soaps in combination had not hitherto been investigated.

Among those who joined in the discussion, Mr. L. A. Ravald (North Thames Gas Board) said that his research department was introduced to calcium plumbate by Mr. Read's organisation about 18 months ago, at a time when they were investigating the blistering and detachment of films of finished paints of three-coat systems, on immersion in water. The paints forming those films had been applied to the steel side-sheeting of water-sealed telescopic gasholders, and in no case was the underlying red lead primer involved. Although their difficulties had occurred with paint systems applied to steel, the defects were not considered to be due to rusting or to the nature of the surface, but to other causes unknown.

Mr. Ravald showed by a photograph an example of the type of blistering experienced, blisters formed in paint systems applied to ground glass test plates on water immersion. Incidentally, the same result had been produced on Perspex and Monel plates. The paint systems were normal three-coat ones, *viz.*, red lead to B.S.S. 1011, with second and third coats based on linseed oil, with or without a small addition of varnish. The blisters were of varying sizes, and the larger blisters formed between the red lead primer and the second coat.

On one plate, said Mr. Ravald, there were, even on the larger blisters, small upstanding blisters which had formed later between the second and finishing coats. In all cases the red lead was unaffected. All the blisters were filled with water. Possibly the suggestion made by Dr. Rains during the discussion at the Rothesay conference of OCCA last year, of the expansion of the film by the action of water, was a feasible explanation.

Absence of Blistering

Mr. Ravald next showed a photograph of the effect of using calcium plumbate paint as the second coat; there was almost complete absence of blistering. He said he would be glad of an explanation of the interesting and important suppression of the blistering tendency by calcium plumbate paint. That suppression had so far not been obtained by other undercoats.

Mr. N. A. Bennett suggested that probably the particle size of calcium plumbate pigments was very much larger than in red lead; and he added that no reference had been made to particle shape. All the tests referred to in the paper were made on nicely abraded steel panels, and perhaps because of the relatively large size of the particles, and on account of their shape, if tests were made on surfaces such as those to which primers, and so on, were usually applied, relatively poor results would be obtained.

Mr. Read replied that the particle size was not very different from that of the average non-setting red lead, except for the coarse aggregates at the bottom. There was no definite crystal shape; the shape was much the same as in non-setting red lead. As to the condition of the surfaces to which the paints were applied, he said that not very many large scale tests had been made yet, but there were some outside tests which backed up the accelerated tests he had mentioned.

Mr. Neil R. Fisk recalled that from time to time one had heard the forecast that linseed oil was on the way out and that the future was with derivatives and compounds. It was interesting, therefore, to hear from Mr. Read that the best results with calcium plumbate in sea-water exposure were obtained when using the simple linseed oil vehicles.

OVERSEAS CHEMISTRY AND INDUSTRY

Progress of India's Fertiliser Plant

Co-operative Enterprise Speeds Work at Sindri

PILOT-SCALE production at the Sindri fertiliser factory, in Bihar, India, is expected to begin by the end of this year and full production should be reached during 1951. The factory will manufacture 1000 tons of ammonium sulphate per day.

Sindri is within easy reach of coal and coke quarries and water from the Damodar river. It is connected with India's main railway system.

The broad planning of the project was undertaken by India's Ministry of Industry and Supply. After preliminary exploration, a contract was signed in February, 1946, with an American firm, the Chemical Construction Corporation, for the design and fabrication of the plant and other services and with the (U.K.) Power Gas Corporation, which was entrusted with the purchase of the plant and the provision of building services.

The factory is divided into four main groups: power house, gas plant, ammonia synthesis, and sulphate plant. As a by-product, approximately 1000 tons of lime slurry will be produced per day.

Plans are in hand for the installation of a cement works to manufacture Portland cement, some 300 tons daily, using the by-product lime slurry as the main raw material.

Fifteen thousand tons of structural steelwork was required, and this, as well as a large quantity of low pressure plant, has been fabricated from home produced steel.

Orders for plant, ranging from the power house to all the intricate plant for gas production, gas compression, ammonia synthesis and sulphate production, were placed in the United Kingdom and the U.S.A.

An indication of the potential value of the scheme to India's agricultural industries is given by the following data, which show clearly the large proportions of the installations: Capacity of the power house, 80,000 kW; electric power cables in the factory, 170 miles; pipe lines, 80 miles; consumption or water, 12 million gal. per day; railway track on the site, 12 miles; raw materials handled per day, coal 1200 tons, coke 600 tons, gypsum 1800 tons.

The implementation of the project is considered an outstanding example of international team work. American designers and United Kingdom constructional engineers have co-operated in securing the early completion of the factory and, to build up the operational team, specially selected Indian mechanical, electrical and chemical engineers were sent for training to the United Kingdom and the U.S.A. The latter, now returned, are enriching the knowledge they gained abroad by practical experience.

Indian Industries Seeking Materials and Equipment

THE trend of Indian policy for the development of native chemical industries was indicated at a recent meeting in Delhi of the Fiscal Commission at which evidence in support of further protection was given by the president of the Indian Chemical Manufacturers' Association.

In a technical and complicated industry like the chemical industry, tariff protection by itself, it was urged, would not ensure quick or efficient development. Positive measures like assistance in the supply of essential raw materials, import of essential apparatus and equipment and fostering markets abroad were needed. The recent export and import policy had considerably added to the difficulties of this industry, although in recent weeks some welcome relaxation in commercial policy had been noticeable.

Mr. C. P. Reddi, Industries Minister of Madras, told the Madras Legislative Assembly that the Madras Government had sanctioned the opening of a well-equipped chemical and analytical laboratory for testing the industrial potentialities of raw materials in the State. The Government was recruiting staff and intended to start the laboratory at an early date. The investigation for exploiting the rich lignite deposits in South Arcot would be hastened up this year. The question of appointing foreign experts trained in the extraction of lignite ores was under consideration.

Iron ores available in certain parts of the State like Salem and Sandur, had been sent to Norway for analysis, said the Minister. The possibility of starting a special steel alloy plant would be considered.

SCIENTIFIC RESEARCH IN BELGIUM

Effective Co-operation by Universities and Industry

COLLABORATION between a number of different interests to promote scientific research has achieved exceptionally successful results in Belgium. The means were reviewed recently at a meeting of the Société de Chime et Industrie (*Chimie et Industrie,* Feb., March; 176-181, 295-299) at which the inception of the programme in 1927, with the active support of King Albert, was recalled. Then, in less than three months, Fr.100 million was collected in response to an appeal by the universities of Brussels and Louvain, 25 per cent of the total having been contributed by the Solway organisation.

The FNRS (Fonds nat. de la Recherche scientifique) was established by Royal decree in June, 1928, and some details of the organisation and work of this body have been given in a paper by Professor Jean Baugniet, Rector of the Free University of Brussels.

On the governing council of the FNRS are represented the four universities, and heads of other educational establishments, such as the Royal Military School, the Hainault Polytechnic Faculty, the Agronomic Institutes of Gembloux and Ghent, the School of Veterinary Medicine.

Twenty-four Departments

Its principal function was to give financial support to scientists and research workers, students, and young people showing promise, and to provide books, equipment, opportunities for travel and so forth. The whole realm of science was classified into five main groups comprising in all 24 branches, each with its own committee.

Some attention has been given to nuclear research, and a special branch for nuclear physics was established in 1947, having facilities for work in university and other laboratories. This work has been on a relatively small scale, and progress has been handicapped by lack of suitable equipment and trained staff. It is hoped, however, to extend the work and make a worthwhile contribution to Western Europe achievements.

The Belgian Congo is included in the general scheme of research; for it is recognised that the great African territory offers wide scope in many fields for exploration and research. This is nowhere more clearly apprehended than in the Congo itself, and the Union minière du Haut-Katanga has made donations of Fr.10 million to each of the universities —Louvain and Brussels. It is suggested that such generous examples would be more frequent if leaders of industry could be relieved from the more onerous and restrictive forms of taxation.

In another paper Dr. Louis Henry, Director of the Inst. pour l'Encouragement de la Recherche scientifique dans l'Industrie et l'Agriculture, Brussels, established in 1944, gives an account of its functions and achievements in the applied sciences. Its main purpose is to finance research and to build up a competent staff of trained workers. So far Fr.40 million has been expended in financing various research programmes, including most branches of metallurgy, and special attention has been given to improved methods of manufacturing Thomas steel; soil and cultivation studies, and milk production.

Nationalising Indian Salt Industry

THE Government of Madras has declared that the salt industry in the State will continue to be a public utility service for a further six months from April 11. In September 1949 the salt industry in the State was declared a public utility service until April 10, 1950.

The nationalisation of the salt industry in the United States of Travancore and Cochin in South India, is under consideration by the State Government. In furtherance of the policy of nationalisation, the Government of Travancore and Cochin has issued an order taking over a salt factory in South Travancore.

An application has, however, been moved before the High Court for a writ of *certiorari* to cancel the notification and direct that the State Government should not take over the salt factories on the ground that the Act is *ultra vires* of the Indian Constitution.

Swiss Aluminium Company's Lower Profit

The board of the Aluminium-Industrie A.G. Chippis, the Swiss aluminium holding company with international ramifications, reports a net profit during 1949 of S.Fr. 7,106,482 (S.Fr. 7,596,109 in 1948). The dividend, of S.Fr. 60 per share, is unchanged.

OVERSEAS CHEMISTRY AND INDUSTRY

New Industries Planned for Ceylon

Latex Rubber, Soap Supplies and Paper Pulp

AN ambitious project for the development of the latex rubber industry in Ceylon is now under consideration. It could make a sevenfold increase in export figures. One reason for the slow progress of the industry has been lack of facilities for production and storage in bulk. Following the recent visit of Mr. F. D. Ascoli, a director of Dunlop's, to Ceylon, it is proposed by the company to establish a factory for the concentration of latex in Colombo, together with bulk storage installations. The scheme is estimated to provide for the handling of 200,000 gallons of latex monthly, equivalent to 6000 tons of rubber latex foam annually.

* * *

Hope of making Ceylon self-sufficient in the soap industry was brought a stage nearer by the recent opening in Negombo of a new factory. Mr. G. G. Ponnambalam, Minister of Industries and Industrial Research, said that the Government proposed to establish a number of similar factories. One problem at present confronting the industry was the supply of caustic soda, which had to be imported. Plans were, however, well advanced for the manufacture of this product in Ceylon in the near future.

* * *

Desiccated coconut has been in considerable demand not only in Australia and South Africa, but also in Europe and the United Kingdom, resulting in a release by the Government of a further 3500 tons for manufacture by millers. It is expected that free import will shortly be permitted to the U.K. Reduction in demand for white edible copra from Pakistan has resulted in a drop in prices. Production of white copra is restricted, and is made in specially installed kilns. Reports from some of the dry coastal areas, however, indicate that an almost equally good result can be achieved by sun drying.

* * *

A modern process of pulp manufacture, particularly suited for the exploitation of raw materials available in Ceylon, is to be adopted in the Government's new paper mill, which will be established in the neighbourhood of Batticaloa in Eastern Ceylon. This monosulphite process has already been successfully utilised in Turkey, Italy, France and Germany for a number of years. It is being progressively recognised in the U.S.A. and Canada. because it has been found to be particularly adapted for pulping agricultural residues. The process has also been independently investigated for the Ceylon Government by the Cellulose Development Corporation of England and by the Institute of Cellulose Chemistry at Darmstadt, Germany.

Australian Exploration for Pacific Oil Sources

IN a current review of Australia's search for oil, the director of the Bureau of Mineral Resources, Dr. Raggatt, states that at least £7.5 million has already been spent on exploratory work in Australia, Papua and New Guinea. An aggregate distance of about 87 miles has been drilled. Although no commercial producers have as yet been discovered, there appear to be grounds for hope that the search will not go unrewarded. Many of the 268 test wells drilled so far in Australia and the other territories have been reported as "not proved" rather than condemned.

Dr. Raggatt states that conditions on the mainland are less promising than those in Papua and New Guinea, but are good enough to warrant further investigation. He emphasises that one good discovery could make Australia self-sufficient in oil supplies for many years.

The Shell and Vacuum groups are engaged in the search, as well as an Australian firm, Oil Search, Ltd., the main work being in Papua and New Guinea, where £5 million had been spent up to the end of 1949.

The N.V. Nederlandsche Nieuw Guinea Petroleum Mij. (a member of the Royal-Dutch Shell group) first established commercial production in the Klamono region of Dutch New Guinea. The importance of Klamono is shown by the fact that out of 14 wells drilled, eight were producers. Annual output is now some 250,000 tons.

Technical Publications

THE full proceedings of the second conference on chemical works safety, held at Scarborough in October last (THE CHEMICAL AGE, *61*, 523), have now been published in booklet form and are available, price 5s., from the Association of British Chemical Manufacturers.

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CHEMISTRY of zinc is included among the abstracts of recent technical literature presented in the March issue of "ZDA Abstracts" (Volume 8, No. 3), obtainable from the Zinc Development Association, Oxford.

* * *

"THE Meaning of Research to American Industry" is the subject of an informative article by Raymond Stevens in the Spring number of *Progress*, published by Lever Brothers & Unilever, Ltd. This underlines the pre-eminent status of research in post-war America and shows how expenditure there has greatly increased sales. The development of the vast research programmes of some oil and chemical companies in the U.S.A. is illustrated by specific examples.

* * *

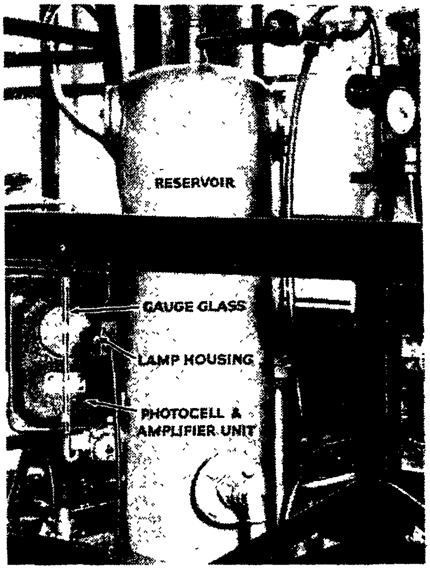
HINTS on the installation and maintenance of industrial electric motors and generators, with notes on their various applications, are given in a neat pocket-sized publication issued by Higgs Motors, Ltd., Witton, Birmingham. The booklet, price 1s. 6d., also contains many useful tables, including the general conversion of length, area, volume, weight, speed, etc., the physical properties of metals, and equivalent temperatures.

* * *

CHANGES in sulphite cellulose in respect of its hot alkali solubility and copper number during various bleaching processes are studied by Olof Samuelson and Curt Ramsel in *Svensk Pappers Tidning* (Swedish Paper Journal, No. 6), official organ of the Swedish Paper Mills Association, The Swedish Association of Paper and Cellulose Engineers, etc.

* * *

PROGRESS made in permanent magnet materials since the beginning of the century and reports of research carried out by the Permanent Magnet Association, Sheffield, are described by Alan Torry and Alun Edwards in an article "Developments in Modern Magnet Alloys" featured in "The Nickel Bulletin" (Volume 23, No. 3)—published by the Mond Nickel Co., Ltd.



[Courtesy, General Electric Co., Ltd., London

A recent application of photo-electric control is in the injection of lubricating oil into refrigerator compressor units. The Osram photocell equipment consists of a small lamp housing and optical system, a photocell amplifier and relay unit, with an arrangement for intercepting the light beam by means of a column of oil in a glass tube. When a refrigerator unit is filled, the oil level in the gauge glass falls, light falls on the photocell and the associated electrical equipment starts a pump to draw sufficient oil to fill the system.

NEW editions of its brochures on pure ephedrine products, heprona, benzevan and collumina are now available from Evans Medical Supplies, Ltd.

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UNSTEADY heat conduction in plates, cylinders and spheres is dealt with in the "Sulzer Technical Review" (No. 3, 1949), published by Sulzer Bros. (London), Ltd. Many thermal problems which occur in different forms in technical work are discussed, such as problems of space heating and heat accumulation or the calculation of stresses in machine parts due to temperature variations in service.

The Chemist's Bookshelf

THE CHEMICAL ANALYSIS OF FOODS. Fourth Edition, 1950. By H. E. Cox. London: J. & A. Churchill, Ltd. Pp. 340. 28s.

This book, which is described as a practical treatise on the examination of foodstuffs and the detection of adulterants, is devoted exclusively to the special methods required in food analysis. General procedure in organic analysis and theoretical principles, if not already familiar to the reader, have to be sought elsewhere.

Foods are classified under ten broad headings covering almost every conceivable type of food. Each of the corresponding chapters is in the nature of a separate monograph, wherein are described the methods of analysis and examination usually employed, together with short accounts of the preparation and properties of the foods as they appear on the market, and the likely impurities and adulterants.

In bringing the book up to date for the fourth edition, the author has deleted a number of methods that are not of contemporary interest, and has managed, without any appreciable increase in the size over the third edition (1946), to introduce a fair amount of new matter and references to recent papers. Included are determinations of various trace elements and vitamins, examination of baking powder, vinegars, soya meal, onions, meat extracts, sausages, tomatoes, ketchups, egg products, etc.

Recent work appears to have been well covered to about fifteen months ago, as a search by the reviewer for the presence of references to a number of important papers and reports of the previous two or three years was completely successful. In some cases, adequate details of procedure are given.

Descriptions of some of the methods could be improved. The passive and the imperative are used indiscriminately, and sometimes they appear close together, *e.g.*, determination of riboflavin in flour (p. 68), and determination of fluorine in wines (p. 184).

Since the demand on space does not permit other than literature references to many valuable methods, particularly those concerned with the use of physical instruments such as the Spekker, the book is not a complete manual on food analysis. It is, nevertheless, an excellent guide, and the chemist who is called upon to carry out such work can expect to find here, if not the full details of any particular method, at least the key to all the vital information.

COLLOID CHEMISTRY. H. B. Weiser. 2nd Edition. London: Chapman & Hall, Ltd. Pp. 444. 30s.

The purpose of the first edition of this book was to present to those who had had an elementary course in physical chemistry a more comprehensive treatment of the theory and application of colloidal behaviour. The present edition follows the same general plan and incorporates many of the advances which have been made in this field since the appearance of the first edition 10 years ago.

Among more important changes and additions is the up-to-date revision of the chapter on the mechanism of adsorption of Brunauer, Emmett and Teller's theory and gas vapour by solids and the inclusion of its application to the determination of surface area. Other new material is the method of surface area determination (Harkins and Jura) and the section on capillary condensation theory has been revised. In the chapters dealing with adsorption, that on wetting action has been rewritten and rearranged and a brief section on chromatographic analysis has been added. Although a section on applications of ion exchange is now included, no theory is given nor is mention made of the usefulness of ion exchange resins in the separation of inorganic ions, *e.g.*, the purification of the rare earths.

Mention is now made of Studinger's viscosity law method for the determination of molecular weight and the discussion on the applications of the ultracentrifuge to sedimentation and particle weights has been expanded. To the subject of stability of hydrophobic sols a fairly extensive addition has been made concerning the theory of the Dutch chemist Verwey, while the material on the flocculation of clays, formerly a separate chapter, is now dealt with here.

· HOME ·

Rubber Research

What is stated to be the largest rubber research centre in the British Commonwealth will be opened at Fort Dunlop on June 7 by Sir Lawrence Bragg, Cavendish Professor of Experimental Physics, Cambridge.

BDA Fellowship

A sum of £1000 to endow a Research Fellowship to Bradford Technical College has been received from the Bradford Dyers' Association by the Bradford Further Education sub-committee. It is proposed by the donors that the Fellowship be tenable for two years at £500, and the subject should be in the fields of tinctorial or textile chemistry.

Drugs and Fine Chemicals

In an article dealing with antihistaminics (THE CHEMICAL AGE, *62*, 332), following the formulae for phenergan and chlorotrimeton, it was stated that "the pharmacological effectiveness of these drugs is approximately in the order: benadryl, pyribenzamine chlorotrimeton and phenergan." It has been pointed out that the drugs mentioned are arranged in ascending order of potency. (This series of articles has temporarily been interrupted by the indisposition of the author.)

Patents Fees

New fees for patents for inventions came into force on April 1, under the Patents and Registered Designs Appeal Tribunal Fees Order, 1950, as follows: £3 upon the filing of every notice of appeal to the Appeal Tribunal; £5 on the filing of every notice of appeal to the Court of Appeal from a decision of the Appeal Tribunal; and £2 on every order of the Court of Appeal made on any such appeal. In exceptional circumstances the fees may be remitted.

Four Killed by Ardeer Explosion

Four women workers were killed in an explosion in a cartridging house of the I.C.I., Ltd., explosives factory at Ardeer, Stevenston, Ayrshire, on April 4. They were working by themselves in a small cartridging department wrapping explosives when the explosion occurred. The Ardeer factory is one of the biggest explosives works in Europe. In reply to a question from Colonel Sir Charles MacAndrew in the House on Wednesday, April 5, the Secretry of State for the Home Department (Mr. Chuter Ede) stated that one of His Majesty's inspectors of explosives had been instructed to investigate the cause of the accident. The House expressed its sympathy with the relatives.

"Technical Backwardness"

Professor J. D. Bernal, addressing the third plenary session of the National Union of Student's congress at Brighton, last week, said: "Only about 10 per cent of Britain's scientists are concerned with inventions and the perfection of new processes. . . . What we don't realise is how far we are behind in both these fields. It is one of the principal factors in the technical backwardness of British industry."

Welding Research Prize

The British Welding Research Association announces that an award of £100 is again being offered for the best paper submitted on a research into welding or its applications. The prize is from a fund supplied in 1948 by the British Oxygen Co., Ltd. Candidates must not be older than 35 years of age on January 1, 1950. Papers should not be more than 5000 words, and copyright of the winning entry shall become the property of the BWRA.

Trade Unions and Chemists

A protest against the presidential address of Professor J. W. Cook to the RIC in Glasgow (THE CHEMICAL AGE, *62*, 501-2) when he deplored the pressure being placed on chemists to join trade unions, has been made by the Association of Scientific Workers, Scottish area. The association maintans that its aims are essentially the same as those of the Institute—improvement of the status of the scientist in industry—and that this can only be successfully achieved by trade union.

Oil Deposits in Scotland

The view that there might be a considerable amount of oil below Downholland Moss, Formby, was recently expressed by Dr. G. M. Lees, chief geologist of the Anglo-Iranian Oil Co., Ltd., at the launching at Birkenhead of the tanker *British Trust*. About 10 or 12 years ago, he said, oil was struck at a depth of about 100 ft. So far about 8000 tons of oil had been produced but it was believed there was a much larger accumulation in that district. The company had sunk three wells, one of them to a depth of 7500 ft.

· PERSONAL ·

PROFESSOR **T. P. HILDITCH**, of Liverpool University, was on April 4 elected hon. vice-chairman of the Liverpool and North-Western Section of the Royal Institute of Chemistry at the annual meeting at Liverpool University. **DR. M. CRAWFORD**, head of the Chemistry Department of the Wigan Mining and Technical College, was elected chairman, and **MR. B. D. W. LUFF**, vice-chairman. Mr. Luff was re-elected hon. treasurer, and **MR. J. ASHLEY-JONES** was re-elected hon. secretary.

SIR EDWARD APPLETON, principal of the University of Edinburgh, and **ALEXANDER ROBERTUS TODD**, professor of organic chemistry in the University of Cambridge, are among those on whom the Senate of Glasgow University is to confer honorary degrees.

The Senate of London University has conferred the title of Fellow of the University College, London, on **PROFESSOR J. W. COOK**, president of the Royal Institute of Chemistry and Regius Professor of Chemistry, Glasgow.

PROFESSOR FRANK BELL, D.Sc., Ph.D., F.R.I.C., head of the department of pharmacy and chemistry at Belfast College of Technology has been appointed to the Chair of Chemistry at the Heriot Watt College, Edinburgh. He will take up duty on September 1. Professor Bell has had a distinguished career serving at Battersea Polytechnic and the Blackburn and Lancaster Technical Colleges as principal, before taking up his Belfast appointment in 1946.

DR. D. H. R. BARTON has been appointed to the university readership in organic chemistry tenable at Birkbeck College from October 1; the title of reader in chemistry has been conferred on **DR. A. G. FOSTER**, from the same date, in respect of the post held by him at Royal Holloway College.

SIR HENRY DALE has been appointed adviser to the BBC on scientific programmes, for a year beginning July 1. He will give advice on the content and co-ordination of broadcast talks on science and will also examine the possibilities of developing scientific programmes for television.

MR. G. W. LACEY (director, British Aluminium Co., Ltd.) and **DR. W. J. WORBOYS** (I.C.I. Plastics Division) have been re-appointed members of the Council of Industrial Design. New members appointed to the Council include **SIR WILLIAM PALMER** (chairman, British Rayon Federation), and **MR. A. WHITAKER** (chief research and design engineer, Ascot Gas Water Heaters, Ltd.).

The Institute of Packaging announces the appointment of the following officers for 1950/51: **MR. JOHN EVAN COOK**, joint managing director of Evan Cook's Packers, Ltd., has been elected the first chairman; vice-chairman, **MR. E. H. DICKENS**. Council: **T. DYKE**, **A. F. MUCH** and **A. ROGERS** re-elected, with the following additional members: **J. CASTLE** (Eburite Corrugated Containers, Ltd.), **K. M. CAVE** (British Drug Houses, Ltd.), **J. J. FERRIGI** (Shell Petroleum Co., Ltd.), and **E. G. O. RIDGWELL** (G.E.C., Ltd.).

M. CAQUOT (France) has been elected president of the International Organisation for Standardisation (ISO) in succession to Mr. Howard Coonley (U.S.A.). Well known as a civil engineer, M. Caquot's achievements include the construction of a number of important French bridges in reinforced concrete.

MR. ROBERT T. HASLAM, a vice-president and a director of Standard Oil Company (New Jersey), plans to retire in the autumn and has asked not to be nominated for re-election as a director. Prior to becoming a member of the board of Standard Oil Development Company, in 1927, he was assistant professor and head of the School of Chemical Engineering Practice at the Massachusetts Institute of Technology, and for several years directed the research laboratory of applied chemistry there. His book, "Fuels and Their Combustion," is one of the standard works on the subject; he is also co-author of "Britain's Fuel Problems."

MR. WALTER DENT REDMOND, Rufford, near Ormskirk, managing director of Garston Bottle Co., and a director of several chemical and brick companies, left £36,064 (£32,547 net).

Federation News : Food and Agriculture Chemists

THE inaugural meeting of the Crop Protection Panel, Agricultural Group of the Society of Chemical Industry will be held on Thursday, April 27, at 6.0 p.m. at the Royal Institution, Albermarle Street, London, W.1.

It is understood that the panel will act as an authority on the problems, particularly the chemical problems, involved in the protection of crops, but its interests will also include livestock and stored products.

The chairman of the panel will be Dr. L. H. Lampitt and the secretary Mr. W. E. K. Piercy.

A paper on "Advances in Chemical methods of Crop Protection" will be presented by Dr. Hubert Martin (Long Ashton Research Station).

SCI Food Group

THE report for 1949-50 of the Food Group of the Society of Chemical Industry, presented at its annual general meeting on April 12, revealed that membership had increased by five during the 12 months ended January 1, the total being 1074. In the same period the Microbiological Panel increased its membership by 10 and the Nutrition Panel by 40. Membership of the former at January 1 was 437 and of the latter 860.

Arrangements for the next session are already well in hand. The summer tour will begin on Saturday, June 3, when a party leaves for Norway. The tour will be centred in Oslo for four days and in Bergen for a day and a half.

Plant Manufacturers' Officers

AT the recent annual general meeting, in London, of the British Chemical Plant Manufacturers' Association, the following officers were appointed for 1950: Chairman, Major V. F. Gloag, M.C. (Simon-Carves, Ltd.); vice-chairmen, Mr. N. C. Fraser (W. J. Fraser & Co., Ltd.), Mr. W. J. Hooton (S. H. Johnson & Co., Ltd.), Mr. H. V. Yorke (Bennett, Sons & Shears, Ltd.); hon. treasurer, Mr. P. W. Seligman (The A.P.V. Co., Ltd.); other members of council, Mr. W. R. Beswick (Ashmore, Benson, Pease & Co., Ltd.); Mr. B. L. Broadbent (Thos. Broadbent & Sons, Ltd.); Dr. G. E. Foxwell (Clayton, Son & Co., Ltd.); Mr. E. S. Franklin (Torrance & Sons, Ltd.); Mr. K. Fraser (W. J. Fraser & Co., Ltd.); Mr. A. G. Grant (Whessoe, Ltd.); Mr. J. C. Haithwaite (John Thompson (Dudley), Ltd.); Mr. G. N. Hodson (Hathernware, Ltd.); Mr. A. M. Hutcheson (Thompson Bros. (Bilston), Ltd.; Dr. R. Lessing (The Hydronyl Syndicate, Ltd.); Mr. B. N. Reavell (Kestner Evaporator & Engineering Co., Ltd.); Mr. J. Arthur Reavell (Kestner Evaporator & Engineering Co., Ltd.); Mr. G. W. Riley (Geo. Scott & Son (London), Ltd.); Dr. R. Seligman (The A.P.V. Co., Ltd.); Mr. E. Smyth (Peter Brotherhood, Ltd.); Mr. R. F. Stewart (Dorr-Oliver Co., Ltd.); Mr. S. G. Watson (W. C. Holmes & Co., Ltd.); Mr. J. W. Wright (Cannon Iron Foundries, Ltd.).

OBITUARY

DR. J. A. CROWTHER, Emeritus Professor of Physics in the University of Reading and vice-president of the Institute of Physics, died at his home at Treyarnon Bay, Cornwall, on March 25.

The professor was noted for his work in radiology, being an honorary member of the Faculty of Radiologists, and, in 1936, president of the British Institute of Radiology. In 1924 he published a textbook on "Principles of Radiography," and 20 years later—two years before he retired—he edited the "Handbook of Industrial Radiology." Other textbooks followed.

In 1920 Professor Crowther co-operated in the foundation of the Institute of Physics, of which he was honorary secretary from 1932-1946, and later vice-president until the time of his death.

On his appointment to the Chair of Physics at Reading in 1924, he set about building up a small research school to investigate the action of X-rays on those physical systems such as colloids which are related to living matter. This work was enlarged in 1935 under the auspices of British Empire Cancer Campaign.

His interest in the properties of X-rays and the radiations from radioactive substances was derived from Sir J. J. Thomson at Campridge, and in the six years following 1906 he published 16 papers on the passage of X-rays and beta-rays through material media.

Next Week's Events

MONDAY, APRIL 17

Society of Chemical Industry

London: 26 Portland Place, W.1, 6.30 p.m. (Plastics and Polymer Group). Dr. D. Cleverdon and Mrs. D. Laker (Distillers Co., Ltd.): " The Molecular Weights of High Polymers—1, The Technique of Osmometry; 2, Some Consequences of Comparing Osmometric and Other Molecular Weights."

Royal Institute of Chemistry

Hull: Royal Station Hotel. 7.30 p.m. Dr. R. Holroyd: " The Chemistry of Aviation Petrol."

The Radio and Electronic Component Manufacturers' Federation

London: Grosvenor House, Park Lane, W.1, 10 a.m. to 6 p.m. (also Tuesday and Wednesday). Seventh private exhibition of British components, valves and test gear.

Swiss Industries Fair

Basle: Daily—until April 25.

Lyons International Fair

Lyons: Daily—until April 24.

TUESDAY, APRIL 18

Manchester Building Trades Exhibition

Manchester: City Hall, Deansgate. Daily—until April 29.

Society of Dyers and Colourists

Glasgow: St. Enoch Hotel, 7.30 p.m. C. L. Bird and O. Newsome: " The Application of Logwood to Wool."

Society of Chemical Industry

Birmingham: (Birmingham and Midland section). Conference on " Materials of Construction "—until April 20.

The Institute of Physics

Birmingham: University, Edgbaston. Exhibition of Vacuum Equipment (Two days).

Textile Institute

Morley: Town Hall, 10 a.m.-5 p.m. One-day conference on " The Reclamation of Fibres."

WEDNESDAY, APRIL 19

Royal Institute of Chemistry

London: University College, Gower Street, W.C.1, 8 p.m. (Jointly with SCI). " The Physical Chemistry of Drug Action —a Symposium." Prof. Sir Cyril Hinchelwood: " Introductory Observations "; Prof. F. A. Paneth: " The Use of Tracer Elements in Pharmacology "; Prof. A. Albert: " Ionisation: An Important Factor which is Sometimes Critical "; H. R. Ing: " The Effect of Spatial Factors in the Activity of Drugs."

The Plastics Institute

London: Waldorf Hotel, Aldwych, W.C.2, 6.30 p.m. Dr. C. A. Redfarn: " PVC Leathercloth."

Royal Statistical Society

Newcastle-on-Tyne: 18 Lovain Place, Newcastle. Chemical Industries Club, 6.30 p.m. D. J. Desmond: " Specifications and Tolerances."

Electrodepositors' Technical Society

Eastbourne: Grand Hotel. Silver Jubilee Conference. (Until Saturday, April 22). Five technical sessions, social and other activities.

THURSDAY, APRIL 20

Sir John Cass College

London: Jewry Street, Aldgate, E.C.3, 6 p.m. Eric Walker (Barrister-at-Law, Gray's Inn): " Trade Marks," first of a series of four lectures.

FRIDAY, APRIL 21

Society of Chemical Industry

London: King's College, Strand, W.C.2, 7 p.m. Annual general meeting, 7.30 p.m. Dr. L. P. Walls: " The Chemistry of Trypanocides," followed by a discussion, opened by Dr. E. M. Lourie.

Oil and Colour Chemists' Association

Birmingham: Chamber of Commerce, New Street, 6.30 p.m. (Midlands Section). Annual general meeting and smoker.

Institute of Physics

Chislehurst: 2.30 p.m. (London and Home Counties Branch). Visit to the laboratories of the British Scientific Instrument Research Association.

Society of Public Analysts and Other Analytical Chemists

Cambridge: Physical Chemistry Laboratory, Free School Lane, 5 p.m. Meeting of Physical Methods Group. Dr. G. Jessop: " The Indirect Determination of Aluminium "; Dr. W. Cule Davies: " The Ilkovic Equation—Its Present Status "; C. H. R. Gentry: " An Electronic Polarometer for Metallurgical Purposes."

SATURDAY, APRIL 22

Institution of Chemical Engineers

Manchester: College of Technology, 3 p.m. (North Western Branch). G. E. Charlish and E. J. Heeley: " Acid Resistant Vitreous Enamelled Chemical Plant—Some Observations on the Enamel Layer."

· OVERSEAS ·

Non-Toxic Insecticide

The U.S. Department of Agriculture is the patentee of the new non-toxic insecticide, Allethrin, now being made in limited quantities by John Powell, Inc., New York. Technically described as the allyl homologue of Cinerin 1, it might largely replace pyrethrum if its present production cost was not extremely high.

Yugoslavia to Produce Coke

The manufacture of coke is to be started in Yugoslavia this year. In 1947, a Yugoslav engineer, Mr. Popovic, discovered that coke could be made from home-mined lignite and work was started last year on the erection of coke ovens at Lukovac, where extensive lignite deposits occur. A separation plant is also under construction.

U.S. Tests of Antibiotic

Terramycin, an antibiotic isolated last year in the research laboratories of Chas. Pfizer & Co. (U.S.A.) is reported to be highly effective against a wide variety of pathogenic micro-organisms. Clinical evaluation is now in progress to discover the efficacy of the drug against pneumococcal pneumonia, virus pneumonia, undulant fever, whooping cough, typhus fever and other diseases.

Synthetic Vitamin A

Potent competition with the natural production of vitamin A, from fish livers, etc., is expected to result from large-scale production by the Hoffmann-La Roche company in New Jersey, U.S.A., of a synthetic form of the vitamin. Other groups, reports *Chemical Engineering*, are expected shortly to collaborate in employing the new process, which is stated to yield a tasteless product which can be sold for 30c. per million units.

Indian Bauxite Deposits

By the discovery recently of large deposits of bauxite in the Belgaum and Kolhapur districts of Bombay State, India's known high-grade bauxite reserves, amounting to 35 million tons, have, according to Indian geologists, been increased by a further 3 million tons. Mr. B. C. Roy, Government of India Geologist, who superintended the investigation, is reported to have recommended a programme of prospecting and assessment of the resources, the development of which would, however, depend to a large extent on the completion of hydro-electric projects in the region.

Yugoslavia to Exploit Oil-Shale Resources

Plant and equipment for the mining and processing of oil shales is being installed near Aleksinao, Yugoslavia, where last year large reserves were proved to exist. Surface deposits alone are reported to be sufficient to support five years' intensive exploitation.

Ownership of U.S. General Aniline

The Washington Federal District Court has dismissed the claim of Remington-Rand, Inc., that it possessed an option to acquire for $25 million a controlling interest in the General Aniline and Film Corporation, which the U.S. Government seized as enemy property during the war. The claim of ownership by I.G. Chemie (Interhandel) is still outstanding.

A New Boron Hydride?

Effective use of the mass spectrometer is reflected in the claim by Dr. Francis J. Norton (General Electric research laboratories, Schenectady, New York) to have established the existence of unknown compounds of boron and hydrogen. A boron hydride containing boron of mass 11 which had been stored at 108° F. below zero had partly decomposed, one of the products appearing to be a stable compound, B_9H_{13}.

A New Air Filter

A filter material for separating fine radioactive particles from contaminated gaseous wastes has been developed for the U.S. Atomic Energy Commission by Arthur D. Little, Inc., Cambridge, Massachusetts. It consists of a combination of treated paper-making fibres and finely divided mineral asbestos fibres, and is made in soft, flexible sheets which are fitted into wooden frames. The filter may have wide use in the treatment of industrial fumes.

Emergency Gas Supply

Proposals which it was claimed would meet the peak load demands in the U.S.A. for natural gas for heating, were described at the last national meeting of the American Chemical Society. Dr. R. M. Deanesly (Universal Oil Products Company) urged that "emergency gas" should be produced by the autothermic cracking process, using propane or similar volatile hydrocarbon and air. Preheated separately to over 1000° F., mixed and allowed momentarily to react, they produce a gas of good burning characteristics and scarcely any of the thermal value is lost.

The Stock and Chemical Markets

BUSINESS this week in stock markets has been restricted by a general tendency to await next Tuesday's Budget statement. It is expected that there will be no important reduction in the burden of taxation.

British Funds again showed moderate improvement, but industrial shares remained uncertain, partly because of the belief that dividend limitation will continue for another year.

Shares of chemical and kindred companies were generally well maintained, with Imperial Chemical at 43s., while Monsanto were 47s. 6d. and Albright & Wilson changed hands around 28s. 9d. British Glues and Chemicals 4s. shares at 20s. 7½d. held their recent rise, and Laporte Chemicals 5s. units changed hands at 9s. 6d. Turner & Newall have been steady at 77s. 9d., United Molasses at 40s. were active in anticipation of good financial results, and Borax Consolidated deferred were 51s. 6d.

Fisons were 21s. 6d., at which there is a large yield on the basis of last year's 12 per cent dividend; the company's new 4¼ per cent mortgage debentures were quoted at 7s. 6d. premium over the issue price of £98. Associated Cement shares strengthened to 78s. and Rugby Cement 5s. shares were 17s. 4½d.

Amalgamated Metal shares remained under the influence of the financial results and changed hands around 19s. 7½d. There was, however, uncertainty again among shares of companies connected with plastics. De La Rue were down to 20s., at which these 5s. shares yield over 12 per cent on the basis of last year's 50 per cent dividend. British Xylonite fluctuated around 65s. 3d. and, elsewhere, the 4s. units of the Distillers Co. were 6d. better at 17s. 6d. Lever & Unilever were easier at 39s. 6d., but British Oxygen have been steady at 94s., awaiting the full financial results.

Triplex Glass 10s. shares remained at the slightly lower level of 17s. 9d., probably affected by doubts about future dividend limitation. Triplex has a strong balance sheet position, which would justify a liberal dividend policy in a good year; and there are no debentures or preference shares ranking in front of the ordinary shares.

United Glass Bottle kept at 68s. 9d., awaiting the financial results. Earnings have for many years been well in excess of dividends paid; sooner or later it would seem shareholders will have a larger return. Recognition of this and the company's strong balance sheet position explains why the shares are valued in the market to show a yield of little more than 4¼ per cent.

Boots Drug shares have been more active around 46s. 9d. Iron and steels have been firm, with few important movements. Dorman Long were 29s. 6d., United Steel 24s. 3d., and Stewarts & Lloyds 50s. 6d. Staveley changed hands around 75s. 6d. In other directions, Glaxo Laboratories have been firm at 46s. 10½d.

Oils failed to hold best levels, but were more active. Shell were 66s. 3d. and Anglo-Iranian changed hands around £7⅛.

Market Reports

INTEREST in the chemical market during the past week has been chiefly concerned with routine deliveries against contracts. New business has been on a fairly good scale, despite the influence of the Easter holiday, and the seasonal demand for fertilisers has continued without interruption. A good call for supplies of tartaric and citric acids is also reported. There has been a steady flow of overseas inquiry and the export trade demand shows little change. The price of butyl alcohol was reduced by £5 per ton as from April 3 and an advance in the price of refined glycerine came into operation on April 1. This advance is due to the need to import crude glycerine at world prices, which are higher than those prevailing in the United Kingdom. Trade in the coal tar products is a little better and a fair amount of export trade is being secured on competitive quotations. Xylol supplies are not easier and the demand continues to be sustained.

MANCHESTER.—Business in the Manchester chemical market was resumed on a quietly steady scale after the holiday break, although up to the present there has been no more than a moderate volume of new bookings reported. The textile and allied trades in Lancashire and West Riding have been calling for steady deliveries of alkali and other heavy chemicals against existing contracts and a satisfactory movement of supplies to other principal outlets is also recorded. Prices as a whole remain on a strong basis. In the fertiliser trade there is a growing demand for superphosphates, sulphate of ammonia and compounds.

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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the *total debt*, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Clay & Son, Ltd. London E. (M., 15/4/50.) Fertiliser manufacturers, etc. March 13, charge, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *£6000. October 15, 1947.

Duc-o-Plastic Finishes, Ltd. (formerly Duc-o-Plastic Finishers, Ltd.). (M., 15/4/50.) March 14, £200 deb., to L. Calo, Brighton; general charge.

Satisfactions

British Celanese, Ltd. London, W. (M.S., 15/4/50.) Satisfaction March 15, of deb. stock reg. September 24, 1946, to the extent of £10,465.

Precision Tool & Instrument Co., Ltd., London, W.C. (M.S., 15/4/50.) Satisfaction March 15, of mort. reg. May 30, 1935.

Yeovil Degreasing Co., Ltd., London E.C. (M.S. 15/4/50.) Satisfaction March 14, of debs. reg. November 19, 1948, to the extent of £2000.

New Registration

Gregory, Hancox & Co., Ltd.

Private company. (480,280). Capital £2000. Soap, chemical and polish manufacturers. Directors: J. Gregory, W. Hancox. Reg. office: Easiclene Works, Hall Street, Blackburn.

Company News

Doulton & Co., Ltd.

Net profit, after all charges, of Doulton & Co., Ltd., was £154,750 (£82,139). The 12½ per cent ordinary dividend is maintained and there is an additional 2½ per cent bonus for 1949. Fixed asset replacement reserve is raised by £75,000.

Agents for Swedish Chemicals

Guest Industrials, Ltd., which last year was appointed British selling agents for Bofors Nobelkrut of Sweden, is now dealing in a large variety of fine and industrial chemicals, synthetic resins and dyestuff intermediates, etc. It is recalled that the Bofors company was founded in the 15th century and that its name has become synonymous with guns, armaments and explosives. During recent years, Bofors has greatly extended its field of activity. In the late 19th century the company was joined by Dr. Alfred Nobel, whose name is perpetuated by the Nobel Prize.

Large Chemical Expansion Proposed

Two very large chemical plants to manufacture bromine and tetraethyl lead are planned for the North of England. Chemists are surveying sites in Anglesey and near Ellesmere Port, Cheshire in furtherance of plans being made by the Associated Ethyl Co., Ltd., which already has plant in Cornwall and Cheshire. "The project will comprise plant for the production of tetraethyl lead, metallic sodium, ethyl chloride, ethylene diochloride and the extraction of bromine from sea water," a company statement recorded on April 3. It is hoped the plants will begin operating early in 1953. The firm's chemists are believed to be examining a site at Almwch on the Anglesey coast, where the amount of salt in the water is higher than in most places.

Whale Oil Totals

It is estimated that the five nations participating in this season's Antarctic whaling have produced about 1.8 million barrels of whale oil, in addition to which there will be some 200,000 barrels of sperm oil and also the catch of the three shore stations, states the Norwegian newspaper *Aftenposten*. Total output last season was 2.2 million barrels, and it is likely that this season's output will not appreciably exceed this amount.

Norway's combined output from pelagic, shore, and sperm whaling this season is expected slightly to exceed 1 million barrels, which is equal to about 170,000 tons. About 70,000 tons will be exported in its raw state, including 50,000 tons sold to the British Ministry of Food for £80 a ton. Last year, unprocessed whale oil was sold at £100 a ton. The remaining 100,000 tons of the Norwegian whale oil production will be processed in Norway.

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Method of preparing rubbery vulcanisable polymeric materials.—B. F. Goodrich Co. May 19 1947. 637,388.

Oxo synthesis process.—Standard Oil Development Co. May 29 1947. 637,389.

Production of protective or paint-holding coatings on aluminium or aluminium alloys.—Pyrene Co., Ltd., H. A. H. Jenkins, and W. E. Wright. June 24 1948. 637,249.

Magnetrons.—Compagnie Générale de Télégraphie Sans Fil. June 10 1947. 637,455.

Process for preparing halogen-containing unsaturated aliphatic nitro-compounds.—N.V. De Bataafsche Petroleum Maatschappij. June 30 1947. 637,252.

Co-polymerisation of substances containing allyl compounds.—Metropolitan-Vickers Electrical Co., Ltd., and W. Simpson. March 2 1948. 637,464.

Explosive compositions containing a water-soluble inorganic salt.—E. I. Du Pont de Nemours & Co. July 25 1947. 637,200.

Polymers and method of producing same. —B. F. Goodrich Co. Aug. 1 1947. 637,395.

Apparatus for separating grease, oils and fats from waste water.—R. H. Newman, and M. P. Hirshstein. Aug. 21 1947. 637,399.

Nitroolefine derivatives of malonic esters and process for preparing same.—C. T. Bahner. Sept. 9 1947. 637,400.

Synthetic resins.—I.C.I., Ltd., H. Brunner, and D. R. Tucker. Sept. 3 1948. 637,262.

Separation of pteroylglutamic acid from related pterins.—American Cyanamid Co. Sept. 26 1947. 637,330.

Manufacture of organic esters of cellulose.—J. F. Neilson, and J. A. Hawkes. Oct. 28 1948. 637,267.

Process of preparing benzene hexachloride.—Solvay & Cie. Nov. 5 1947. 637,412.

Distillation of synthetic alcohols.—Enjay Co., Inc. Nov. 28 1947. 637,414.

Thermal polymerisation of alpha-methyl styrene.—Distillers Co., Ltd., H. C. Highet, F. E. Salt, and H. M. Stanley. Feb. 1 1949. 637,346.

Creep resisting alloys and manufacture thereof.—Soc. Anon. de Commentry-Fourchambault & Decazeville. April 4 1945. 637,711.

Production of metal powders.—E. H. E. Johansson, and C. M. Truedsson. Dec. 14 1945. 637,714.

Metal alloys.—Westinghouse Electric International Co. May 9 1946. 637,786.

Separating thiophene from benzoles by distillation.—Soc. Des Etablissements Barbet. June 28 1946. 637,720.

Methods for extracting alumina from raw anhydrous calcium aluminates.—Soc. Des Ciments Français. Aug. 28 1946. 637,578.

Preparation of beta-aroxy carboxylic acid compounds.—B. F. Goodrich Co. Aug. 29 1946. 637,724.

Processes for the manufacture of magnesia containing refractory materials.—Soc. De Recherches et D'Entreprises Industrielles et Chimiques. Oct. 17 1946 637,794.

Merocyanine and oxonol dyes and process for their preparation.—General Aniline & Film Corporation. Nov. 25 1946. 637,648.

High clarity cellulose esters.—British Celanese, Ltd. Dec. 20 1946. 637,650.

Process for the manufacture of oleum.—P. Guareschi. Jan. 16 1947. 637,585.

Processes for preparing substances comprising paraffin wax.—N.V. Philips' Gloeilampenfabrieken. Jan. 30 1947. 637,586.

Liquid oxygen converters.—W. A. Wildhack. Feb. 4 1947. 637,514.

Production of gamma benzene hexachloride.—H. L. De Waal. Feb. 24 1947. 637,732.

Resinous coating composition.—Wingfoot Corporation. March 3 1947. 637,733.

Art of stabilising rayon type fabric.—Alrose Chemical Co. March 17 1947. 637,656.

Trade Mark Registration Opposed

In the Chancery Division before Mr. Justice Vaisey, Gardinol Chemical Co., Ltd., of New Street, Milnsbridge, Huddersfield, unsuccessfully appealed against the refusal of the Registrar of Trade Marks of their application to have a German company's registration of the trade mark "Lanette" removed from the register. The trade mark was in respect of the wax, of considerable technical importance, used in the medicinal, cosmetic and pharmaceutical trades.

CENSUS OF PRODUCTION

Board of Trade Intentions

THE scope of the Census of Production for 1950 and the information to be obtained have now been settled, after consultation with the Census of Production Advisory Committee.

The statutory form of return, says a Board of Trade statement, will contain sections relating to (1) Working proprietors; (2) Employment; (3) Wages and salaries, etc.; (4) Materials and fuel purchased; (5) Work given out; (6) Stocks at the beginning and end of the year; (7) Output and merchanted goods sold; and (8) Analysis of sales. The first five of the sections will be broadly as for 1949, but only the year's total of wages will be required.

In the output section, firms will also be asked to state separately the total value of sales of their own manufactures, and the total payment received for work done.

A voluntary inquiry into capital expenditure is being undertaken by the Board of Trade and other departments among a sample of industrial firms and it has been decided that, if this inquiry meets with a satisfactory response, no questions about capital expenditure need be included in the Census of Production for 1950.

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Securing the Future

UNITED Kingdom chemical industry is generally acknowledged to be the second largest in the world and more than 3000 chemists are continually employed in its research departments alone. In the light of such facts the apparent neglect of some of the essential supports of an edifice of those proportions, of which convincing accounts have been given in the past few days, might suggest an almost criminal degree of casualness in a more logical system of industrial priorities. Chemical industries can manifestly not be maintained at their present scale—and all the portents show they must do much more than that—if they cannot find in the next decade or two a substantially larger body of human "replacement," qualified chemists with the great variety of skills contemporary industry requires. The same conclusion must be admitted if some drastic improvements are not quickly made in the facilities by which chemical engineers and new types of chemical plant are produced.

The justification of the anxiety on the part of the Royal Institute of Chemistry lest a deficiency of chemists should stultify chemical advancement, perhaps ten years hence, was the frank admission in Birmingham last week by Professor M. Stacey, of Birmingham University, that there is neither room nor places to train all those who hope to become research chemists. The dismal effect of that can well be realised in view of the fact that the professor was describing to sixth-formers of Birmingham and district schools what were their prospects of careers in chemistry. He disclosed, for example, that there were 928 applicants last year for the 53 places available in the chemistry honours school at Birmingham and this year some 700 competed for the 50 vacancies. The number who will pass through that needle's eye—which is certainly not peculiar to the University of Birmingham—will need to be exceptional people, but their ranks will be attenuated. The fault is clearly not the university's, as Professor Stacey was at pains to point out. "We are apparently low down on the list of priorities for new buildings," he said. "We have no influence in getting laboratories built. At present we are accommodating 600 students in laboratories designed to hold 250, and we have been in that position since 1944."

A further example of the apparent

On Other Pages

Leader:

Securing the Future . . 559
Notes and Comments:
No Help from the Budget . . 561
Chemists' Month in New York . . 561
Chemical Expansion in Brazil . . 561
Optical Glass . . 562
A Cautionary Tale . . 562
Chemical Engineering's Needs . . 563
Institute Promoting Fuller Training for Engineers . . 564
Steel Scarcity is Ending . . 565
£11 m. for Coking Plants . . 566
Isotopes by Air . . 566
Responsibility for Texas Disaster . . 566
Scope for Tonnage Oxygen . . 567
Acrylic Resin Emulsion . . 569
Fluorine and Nickel Hazards . . 570
India's Steel Programme . . 570
Synthesis and Derivatives of Acrolein . . 571
Advancing Wool Chemistry . . 573
Isolation of Vitamin B₁₂ . . 575
Drugs and Fine Chemicals in 1949—V . . 576
OVERSEAS CHEMISTRY AND INDUSTRY
Growing Output in Brazil . . 579
S. African Chemical Enterprise . . 580
W. German Steel . . 580
U.S. View of U.K. Refractories . . 581
German Recovery . . 581
Israel's Potash Plans . . 582
India's Surplus Soap . . 582
Industrial Safety Gloves . . 584
Definition of Rayon . . 584

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absence of the note of urgency in matters which intimately concern the future of industrial chemistry here has been brought to light by the chemical engineers, whose research facilities, save in the private departments of the large industrial groups, are relatively scarcer and more primitive than those of any other branch of chemical industry. The indictment is given a new emphasis by the admission made in London last week by the president of the Institution of Chemical Engineers, Professor D. M. Newitt, that all the processes about which they made such a to-do in scientific papers originated, as it were, "in the kitchen." Here, fortunately, the nightmare of having to induce a high pressure reaction *in vacuo* is rendered less oppressive by the knowledge that the Institution has succeeded in convincing the Government representatives that the fundamental problems of chemical engineering deserve study on the scale which has long been given to many other industrial themes no more deserving. That and the provision of larger training facilities for chemical engineers should in the long run infuse new vigour into the drive to produce more chemicals, and new ones, which at the moment is overshadowed by the inspired opportunism and energy of chemical industries in the U.S.A.

The habit of leaving to the enterprise of some other country, generally America, the prestige and profit of what was begun here is now, it seems, no longer to be regarded tolerantly as an old British custom. The president of the Chemical Engineers has left little doubt that this form of altruism is one more of those extravagances which we can no longer afford. It has in the past, he recalls, dissipated our resources in a multiplicity of ways. Buying the "know how" of processes built to implement what were originally British inventions still commonly costs dollars, but the loss is not to be expressed wholly in terms of currency. There is no more disastrous policy—says Professor Newitt—than for an industry to fail to develop its own processes. Dependence on work done abroad saps initiative here and withholds opportunity for experience and training. Most people will agree that even the loss of dollars is by far the least of those evils.

Notes and Comments

No Help from the Budget

TO say that the predominant feature of the Budget proposals was a conspicuous omission—the failure to afford help of any kind to the industries upon which the hope of " safeguarding the future of the people " fundamentally depends—does not misrepresent Sir Stafford Cripps's half-hearted performance on Wednesday. The reasons advanced for the increase by 9d. per gallon of the cost of hydrocarbon oils, and of commercial vehicles by 33⅓ per cent, cannot obscure the discouraging certainty that these further burdens on industry, designed perhaps to enforce submission to the costly railway freight tariffs, must inflate production costs and render all classes of export goods that much less competitive. The large taxation component in the cost of light oils has been repeatedly attacked in the past as an unwarranted burden on industries, among which chemical processes have suffered more than some others. None of those substantial arguments would appear to have had any weight in the 1950 Budget, whose evasion of responsibility to promote any improvement in conditions for industry justifies a demand that something much more realistic shall be put in its place as soon as possible.

Chemists' Month in New York

THAT increasingly familiar phenomenon sometimes known as "dollar aid" can seldom have been better employed than in the cause for which American chemical industries are now being asked to subscribe a quarter of a million dollars. This sum is needed to facilitate in New York in September next year one of the largest gatherings of chemists since the 1947 congress in Great Britain. In 1951, New York will welcome the 12th International Congress of Pure and Applied Chemistry, celebrating at the same time the 75th anniversary of the American Chemical Society. The society, which started with 230 members in 1876, is now one of the largest professional associations of scientific workers in the world, with a membership of more than 63,000. The congress, held every four years, will continue from September 10-13: It is being sponsored by the Division of Chemistry and Chemical Technology of the United States National Research Council. Much of the fund raised will be used to aid foreign visitors, especially those from countries where there is a dollar shortage. The International Union of Pure and Applied Chemistry, which normally meets every two years for setting up uniform chemical standards, will also meet in 1951. The 16th conference is due to take place in New York on September 8 and 9, and will also meet in Washington on September 14 and 15—the 50th anniversary of the National Bureau of Standards.

Chemical Expansion in Brazil

IN marked contrast with what is generally the result of State participation in industries are some of the current results of the Government-and-industry enterprises in Brazil, described in a message from a CHEMICAL AGE correspondent in Teresopolis (Rio). The explanation of the unusual degree of success is probably to be found in the facts that in many of the new chemical undertakings, most of them brought into being in response to the wartime shortage of normal supplies, the Government agencies have provided finance rather than the direction, and the highly developed technology of North American industries has been used on a generous scale. However favourable these factors, the comparatively recent expansion of Brazilian chemical industries to rank fourth in value among all industrial activities is a phenomenon which no one could have predicted ten years ago. Brazil has in fact attained self sufficiency in a number of basic chemical materials notwithstanding some formidable impediments, the scarcity of high-grade supplies of several essentials, such as fuel and trained work people. Nearly all the acetic, hydrochloric and tartaric acids are now made within the country. Sulphuric acid is coming from Brazilian plants on a continually increasing scale, although still largely dependent on foreign sources of sulphur, and home supplies of glycerin and cellulose are sustaining a growing explosives industry. The list of relatively new products could be extended almost indefinitely by the inclusion of the diversity of by-products of the Volta Redonda steel mill and coke ovens. The sum of all these factors, however, does not represent a " water-tight " chemical economy. They are in most cases the starting points of new industries which will call for the many specialised products in plant and materials which Brazil is certainly not yet ready to make for herself.

Optical Glass

THE genesis of optical glass making under scientifically controlled conditions and some of the modern instruments' remote predecessors formed the subject of a far-ranging study by a technologist of the National Bureau of Standards in the U.S.A. That was a review by Francis W. Glaze, whose contribution to the Smithsonian Report has been reproduced as a separate publication, the appeal of which will not be confined to America. " The Optical Glass Industry, Past and Present," serves incidentally to recall how spasmodic has been the growth of optical glass making. Quartz and glass lenses have been found in the ruins of Nineveh, Pompeii and Herculaneum; Ptolemy, in the first century of the present era, wrote a book on optics; yet some 1500 years were to elapse before the invention of the microscope or the telescope, probably by Johann and Zacharius Jansen. This American review records what is not often recalled here, the considerable debt which present optical instruments owe to original work in this country, the conception of the first reflecting telescope, which was to supersede the refractor type, described by Sir Isaac Newton in 1670, and the encouragement by Chance Brothers of immigrant innovators during the 19th century. The first of these was the political refugee Bonteps, associate of the Swiss family of Guinard which preserved and developed Pierre-Louis Guinard's invention, in 1790, of chemically homogeneous glass. The results of that enlightened hospitality have helped to prevent our elipse by the decisive fundamental work on new optical glass materials by O. Schott and his collaborators under the patronage of the University of Jena.

Cautionary Tale

THE need to ensure that the reducing valve is closed before the main valve is opened on a pressure gas cylinder is one of the self-evident things which, at intervals, someone or other is virtually certain to overlook. That was the situation recently at Birmingham University. The compressed hydrogen did what was to be expected, immediately blasting off the rubber tubing connecting it with the apparatus in which the hydrogen was to serve in an experiment, but it also produced a highly alarming incidental effect which would not readily have been foreseen. It instantly ignited, although there was then no evident source of ignition in the laboratory. The gush of flame suggested the possibility that a combustible formation might accidentally have been produced in the cylinder, an alarming theory which Professor Garner and Dr. Townend, of the University, have rejected. Their view favours the probability that ignition was due to an electrostatic spark discharge, the initial rush of gas setting up a potential difference with the formation of an electric charge on the dry rubber tubing. That briefly is the cautionary tale which is presented, perhaps to have salutary results, in the first issue of the *Birmingham University Chemical Engineer*. Since no one was hurt, the incident can be regarded as a useful elementary exercise in foreseeing ignition risks where none is apparent.

CHEMICAL ENGINEERING'S NEEDS

Too Little Research and Process Development

THE relatively short history of the Institution of Chemical Engineers and its rapid rise to recognition and respect among engineering industries were recalled by the principal guest, Sir Walter Benton Jones, at the annual dinner which followed the corporate meetings in London on April 14.

Sir Walter proposed the toast of The Institution of Chemical Engineers. He recalled that, founded in 1921, it was the youngest engineering institution and he congratulated it on having "joined the aristocracy of the society of engineers." He believed that only in Great Britain and the U.S.A. were chemical engineers sufficiently organised to have gained recognition as a single profession.

The Institution rightly regarded a chemical engineer neither as a chemist nor a mechanical engineer, but as a separate species; a man having a sound training in the fundamental sciences and in such parts of engineering and metallurgy as were necessary for the design, construction and operation of plant in which a wide range of physical and chemical processes took place.

The universities recognised the special training required to make a chemical engineer; London, Cambridge, Birmingham and Leeds universities each provided a suitable course leading to a first degree. The Institution encouraged the training of more men and had emphasised the need to provide more facilities for that training. Sir Walter wished the Institution prosperity and rapid progress. He associated with the toast the name of the president. He recalled that when Professor Newitt took charge of the Faculty of Chemical Engineering in the Imperial College of Science he had had not more than 15 students; now he had under his guidance 150.

Scope for Improvement

The President, Professor D. M. Newitt, replying to the toast of the Institution, said he had been reliably informed that chemical engineers were slowly penetrating into the iron and steel industry, and he had reason to believe they had made some useful contributions in connection with ores and gases, and some of the actual steel processes.

One of the Institution's preoccupations during the year had been technological education, but he doubted if there was anything new to say about this at present. Their membership had gone on increasing very satisfactorily. They now had a membership of well over 2000. There was, however, not one lady member—in full membership.

Professor D. M. Newitt

All the processes about which they made such a to-do in their scientific papers were conducted, as it were, in the kitchen, with the most primitive apparatus. They had drawn the attention of the Government to the fact that there were still not sufficient facilities provided for research, and as a result of their representations their vice-president, Mr. H. W. Cremer, had been appointed to the committee set up to discuss this matter. He believed their institution would perform a further valuable service to industry when it had completed this inquiry.

Although every industry seemed to need more and more chemical engineers, it was still a sad fact that in many industries they were still under the domination of foreign influence. In some quarters it was considered not a bad thing to let the other man do the development work, and when he had overcome all the troubles to buy the "know-how" from him. We started the things in this country but we did not develop them. That was particularly the case in regard to atomic fission.

He regarded this as an entirely bad policy. There was no more disastrous policy than for an industry to fail to develop its processes and to look to someone abroad to do it. That killed initiative and the things that we brought were not up to date. Worse still, we did not get the experience and training that could be obtained in the process of development. We should do our best to circumvent that situation. It applied in only a few industries, but in those industries it was having a very bad effect.

Time for Boldness

This was an age in which we could not afford to have misgivings; it was an age for boldness. Industry faced a very great adventure, in which, if they were to be successful, their young members must play their part. They must have the enterprise and the imagination to undertake the big jobs. From what he knew of them, he was sure they would prove themselves worthy of the age and raise the status of chemical engineering.

The past president, Mr. H. W. Cremer, C.B.E., gave a warm and entertaining welcome to the many distinguished people present, proposing the toast of "The Guests." He coupled with it the names of Mr. A. P. L. Blaxter, master of the Worshipful Company of Founders, and Dr. D. T. A. Townend, president of the Institute of Fuel. Acknowledging the value of the latter's distinguished academic and professional career, he ventured the suggestion that, as director of the British Coal Utilisation Research Association, Dr. Townend, in recognition of the high proportion of incombustible matter which came in coal today, should not ignore the interests of rock gardeners when he prepared his reports.

Dr. Townend, who in his response conveyed the greetings of the kindred institutions and societies, congratulated the institution on having maintained its educational and qualification requirements, and upon the further extension of chemical engineering courses and facilities in the provincial universities. Adequate attention was, however, not being paid to the services which the universities could render, if they were given adequate support. Many of the provincial universities were started with the express purpose of helping industries. Had they earlier been given appropriate national support, as distinct from industrial support, the position would have been very different today. The tragedy was that national support had been so belated. Support from industry to the universities had been gratifying, as a whole. Leeds University was greatly indebted to the benevolence of Mr. Charles Brotherton; the new plans provided facilities for chemical engineering work, as well as on ancillary subjects.

Mr. Blaxter also responded to the toast and a final toast to the president, proposed by Mr. F. A. Greene, was accorded with musical honours.

Institution Promoting Fuller Training for Engineers

THE annual meeting of the Institution of Chemical Engineers was held in London, on Friday, April 14. The president, Professor D. M. Newitt, M.C., F.R.S., presided.

The annual report and accounts for 1949 were presented and adopted. The report showed that the rate of increase of membership had been maintained, the increase in 1949 being 212, bringing the total to 2338. The accounts reveal that the general increase of costs has produced a deficiency. It was resolved at a later meeting to increase the amount of the subscription.

Mr. L. O. Newton (hon. secretary) dealing with the institute's educational activities, referred with regret to the continued illness of Mr. J. A. Oriel (chairman of the Education Committee) and reported that Mr. J. Edwards had been appointed the institution's representative on the Chemistry and Chemical Technology Sub-Committee of the Regional Council for Further Education in the South-West.

Negotiations have continued with the Royal Institute of Chemistry on the subject of ordinary and higher national certificates in chemical engineering. Following a request by the Regional Advisory Committee for Chemical Engineering (London & Home Counties), a first draft of a syllabus for a national certificate in chemical engineering has been prepared and is before the Education Committee of the Institution.

The Chemical Engineering Sub-Committee of the Academic Board of Technology for Wales has recommended the establishment of a degree course in chemical engineering in the University of Wales; and a course in chemical engineering is being established at the Birmingham Central Technical College.

The report recorded that, in view of the growth of the institution and its increas-

(*continued at foot of next page*)

STEEL SCARCITY IS ENDING

March Production Equalled 17 m. Tons a Year

OUTPUT of steel in March established a new record, when for the first time production exceeded an annual rate of 17 million tons.

Weekly average output was 329,800 tons, equal to an annual rate of 17,147,000 tons. This compared with the record of 16,898,000 tons set up in February and was 1,274,000 tons higher than the figure for January.

Total output for the first quarter of this year was 4,169,600 tons, or 207,000 tons more than in the first three months of 1949. This represents a considerable step towards the achievement of a total of between 15.75 and 16 million tons foreshadowed in the Government's Economic Survey for 1950.

It is pointed out, however, by the British Iron and Steel Federation that the effect of holidays later in the year must be borne in mind.

Influences which have helped the expanding production are the high level of iron ore imports during the winter months—particularly from North Africa—and good scrap supplies from Germany.

Another contributory factor has been the continuous working week in force since 1947, and the good labour relations which continue throughout the industry.

Future prospects may be influenced by the devaluation of sterling. It is widely felt, however, that there is little justification for the continuance of the steel allocation scheme.

Production of pig-iron also showed an increase in March, being at an annual rate of 9,696,000 tons, compared with 9,295,000 tons a year ago. Details issued by the British Iron and Steel Federation are:—

STEEL INGOTS AND CASTINGS

(Tons)

	1950		1949
	Weekly Average	Annual Rate	Weekly Average
January ...	305,300	15,873,000	288,500
February ...	325.000	16,898,000	311,100
March ...	329,800	17,147,000	312,900
1st Quarter ...	320.700	16,679,000	304,800

FULLER TRAINING FOR ENGINEERS

(*continued from previous page*)

ing responsibilites, the council has appointed Dr. John B. Brennan, M.Sc., Ph.D., A.M.I.Mech. E., as general secretary, to be responsible for much of the work hitherto carried out by the hon. secretaries. Dr. Brennan has been principal and secretary of the Portadown Technical School, Northern Ireland.

The annual report also referred to the Institution's activities in connection with the co-ordination of research in chemical engineering. It recalled that, as a result of representations on behalf of the Institution, the Council of the Department of Scientific and Industrial Research has set up a committee to consider the whole question. The immediate past president of the Institution, Mr. H. W. Cremer, is the chairman of the committee.

The following elections were announced for the ensuing year: President, Prof. D. M. Newitt; vice-presidents: Mr. M. B. Donald, Mr. F. A. Freeth, Mr. A. E. Leighton, Mr. J. A. Oriel; hon. secretary: Mr. L. O. Newton; hon. treasurer: Mr. F. A. Greene; members of council: Mr. N. C. Fraser, Mr. F. H. Garner, Mr. A. G. Grant, Mr. H. Talbot; associate member of council: Mr. A. P. Buchanan.

Medals and certificates for 1949 were presented by the president. The awards were these: Osborne Reynolds Medal, to Dr. F. Rumford, for his valuable services to the Institution, particularly in connection with the associate membership examination, over many years. Moulton Medal: for a paper on "The Fabrication of Chemical Plant in Stainless Steel," by Mr. A. C. Branch and Mr. J. L. Sweeten (associate member). Junior Moulton Medal: for a paper on "The Mechanics of the Displacement of Liquids from Porous Solids," by Mr. D. I. W. Atkinson (graduate). William Macnab Medal: to Mr. Michael Shaw, for the best set of examination papers submitted in the 1949 associate membership examination.

Votes of thanks were accorded the president and the honorary officers and members of council for their work on behalf of the Institution. Dr. H. Levinstein, speaking on this subject, welcomed the great advance which had been made during Prof. Newitt's term as president, and that of his predecessor, in the standing of the Institution.

Recognition of long service to the Institution in another regard was paid by the presentation of a cheque to Mr. H. Talbot, who for more than 20 years has been the Institution's honorary registrar, an office which he now relinquished. The president and Mr. F. A. Greene both spoke of his valuable service in that capacity.

£11 m. FOR COKING PLANTS

New Ovens and Reconstruction

THE Coke Oven National Consultative Council composed of representatives of the National Coal Board, the Coke Oven Managers' Association and the National Union of Mineworkers, at its second meeting in London on April 12, reported that progress was being made in the establishment of consultative machinery in the divisions and at individual coking plants.

Mr. L. O'Connor, director of carbonisation to the National Coal Board, gave an account of the plans already approved by the board in the building of new plants and the improvement of existing ones at a cost of more than £11 million. The board, he said, was considering still further improvements.

Industrial diseases among coke oven workers, and the provision of bathing facilities at coking plants, and of protective clothing, were also discussed.

Texas Disaster Finding

JUDGMENT has been given against the U.S. Government in the test damage suit filed to determine liability for the ammonium nitrate explosion at Texas City, in April 1947 (THE CHEMICAL AGE 56, 497). The judge held the Government was responsible for the blast and accused it of "blunders, mistakes and acts of negligence." The Government is expected to appeal to the highest court. The negligence of the Government was stated to have "reached its peak when it caused or permitted the fertiliser on the two ships principally concerned to be sent to Texas City and there to be handled, unloaded and loaded into ships for shipment abroad."

Among the pending suits for damages, totalling some $200 million, the largest claim is that of the Monsanto Chemical Company, which seeks damages of $50 million. There is also a claim for $11 million by the compensation insurer for Monsanto.

Radioactive Dye Catalyst

SOME American textile concerns are about to introduce what is believed to be the first fundamental change in dyeing procedure for the past 400 years. The dyestuff is developed in a chamber containing a powerful combination of special lamps. Dyestuffs used are a special form of sulphur, diphenyl and naphthol materials. They are padded on to the fabric in one bath with a radioactive catalyst. The reaction, as the fabric enters the light chamber, is described as almost instantaneous.

Development is reported to be advanced and to have indicated that it may be possible in many cases to eliminate the final washing stage. Complete dye penetration as well as evenness are claimed. It is expected that the new method will be in use shortly at the recently organised works of the Shamrock Textile Processing Co., Paterson, N.J.

(continued at foot of next column)

ISOTOPES BY AIR

Value of Light Containers

THE increase in the past two years of the use of aircraft for the carriage of radioactive isotopes is mentioned in a press notice issued this week by the Ministry of Civil Aviation. This describes the comparatively new method of carrying the radioactive material in the wing tips of certain South African Airways aircraft, which dispenses with the need for a heavy lead shield, which previously has rendered the packages a substantial factor in the total of freight.

Now a felt-lined compartment with a hinged lid, painted red, is housed in one of the wing tips, in which the isotopes are packed in a metal cylinder, 4 in. long by 1½ in. in diameter. The cylinder has a "screw-on" top to which is attached a ring for easy handling with a 3-ft. rod to which a hook is affixed.

Radioactive materials do not, of course, damage the structure of an aircraft, or its equipment, but the radiation can cause damage by fogging to undeveloped photographic film. To minimise such effects, consignments of isotopes are packed in containers which fully absorb some types of radiation and reduce the intensity of others. There would be no danger to the health of passengers or crew unless they remained within three ft. of the package for a few hours.

Maximum Radiation Rate

The radiation at the surface of packages of radioisotopes carried by air in the United Kingdom may not exceed 100 milliröntgens per hour. Consignments with the maximum radiation have to be kept three feet from persons and livestock and nine feet from undeveloped photographic film.

The weight of the chemical substance carried in a consignment is usually less than 1 oz.

THE SCOPE FOR TONNAGE OXYGEN

Its Importance in Iron and Steel and Other Industries

THE interest attached to the quantity production of oxygen for industrial purposes has been widened by the support given to the conference held in Paris (April 12 to 14) to discuss the possibilities of co-operative research in the field of tonnage oxygen. This conference was held at the suggestion of ECA and was attended by delegates from all countries receiving Marshall Aid.

Considerable progress has been made in the technology of oxygen production by fractional distillation, which in conjunction with the transport and storage of liquid oxygen has resulted in considerable economies for large consumers. The most recent advances have been in the development of large-scale oxygen plants for installation on the site. The purity of the oxygen produced is normally from 90-95 per cent, but attention has also been devoted to the supply of enriched air with an oxygen content ranging from 40 to 60 per cent.

The only type of plant which so far has been extensively used for the production of medium-purity oxygen on a large scale is the Linde-Frankl, which has already found many applications in the metallurgical, carbonisation and chemical industries. The capacities of some existing plants range upwards from about 50 tons per day. Considerable interest has also been taken in the Kellogg plant, while various other cycles have been suggested which have not yet been tested on an industrial scale.

Limitations

So far the principal disadvantage of tonnage oxygen plants is their inflexibility. A Linde-Frankl plant, for instance, is economic only if run continuously at full load. Until this difficulty has been overcome the scope for tonnage plants seems to be limited to the relatively small number of consumers whose daily requirements are both continuous and extremely large.

The British Iron and Steel Research Association has devoted considerable attention to the use of oxygen both for enhancing flame propagation and temperature during heating and melting operations, and as a chemical agent to increase the efficiency of a purification reaction.

Oxygen has been applied to open-hearth furnaces for both these purposes. The fact that the oxygen flame is appreciably hotter than a normal air flame enables it to be used to accelerate the melting process, but the roof strength sets a limit to this use. The roof is the weakest part of an open-hearth furnace. If, as is generally the case, it consists largely of silica, it melts at a point some hundreds of degrees below the flame temperature, so that oxygen can be added safely only if the extra heat is dispersed downwards and not to the roof.

This often limits the employment of oxygen to the stage at which the mold material is being loaded into the hearth. The difficulty might eventually be alleviated by the installation of all-basic roofs constructed of chrome-magnesite, which would add another 100 degrees or so to the critical roof temperature.

Optimum Results

It has been shown that this application is economically worth-while under certain conditions, the best results being recorded for cold-charged furnaces, which are more common in Britain than in the United States. To obtain optimum results, however, it would be necessary to redesign existing works in order to speed up charging, which is usually governed by the rate at which scrap can be brought to the furnaces.

Oxygen might also be liberally used in a gas-fired furnace to enable the furnace to be successfully operated on a gas of low calorific value. Normally blast furnace gas has too low a calorific value for this purpose, but it has been calculated that if sufficient oxygen could be added to give an effective air enrichment up to 38 per cent, a gas-fired open hearth furnace could be operated on blast furnace gas alone.

In normal open-hearth furnace practice the oxidising reactions of the fully melted bath and slag are assisted by the addition of iron ore or mill scale. It has been found that this reaction can be hastened by the introduction of gaseous oxygen into the bath either through temperature tubes or by means of high-velocity jets through which the gas is blown at high pressure. Oxygen as been satisfactorily injected into the bath of a British furnace at a pressure of about 75 p.s.i. By this means the rate at which carbon was recovered was accelerated to roughly three times the normal speed.

The practical value of this application, however, is still in doubt, particularly where the carbon content does not require to be reduced to less than about 0.2 per cent. On the other hand, where a carbon content of 0.5 per cent or lower is required, oxygen has definite advantages, since the last traces of carbon are the most difficult to remove and by normal methods this process is necessarily slow.

Faster Working

In the converter, oxygen can be used to shorten the blowing time and so increase productivity. This has been accomplished with both practical and economic success in a side-blown converter in Brtain and also a bottom-blow converter in Germany. In both instances oxygen was used to enrich the normal oxygen content of the blast from 21 to 30 per cent. This had the effect of removing a large quantity of inert nitrogen from the blast, resulting in hotter steel and faster working.

Oxygen has been used in electric furnaces either in lances or jets in precisely the same manner as in open hearths. There are several reasons why the addition of oxygen is particularly advantageous here. In the first place, the cost of power represents a very high proportion of the total steelmaking cost, so that the saving in fuel would be greater than in an open hearth. Secondly, electric furnaces are extensively used for the production of low-carbon steels, where oxygen can most effectively be employed. A third consideration is the absence of an oxidising atmosphere, the effect of the oxidising power of the gas being therefore greater than in an open hearth.

Because of these special factors oxygen can be economically used in electric furnaces even at its present price of 10s. 6d. to 12s. 6d. per cu. ft. The largest electric furnace ever built, however, could never absorb the output of a tonnage plant, the average capacity of which would be from 15 to 20 tons daily. Even with an output of 60 tons a day, working three shifts, a furnace of this capacity could not consume more than 100,000 cu. ft. of gas, i.e., between 4 and 5 tons.

From the standpoint of quantity consumption, the most favourable field for tonnage oxygen is probably the blast furnace, which works continuously day and night. Enrichment of the blast has been advocated both to accelerate consumption and to reduce the coke consumed per ton of pig iron. On economic grounds, however, the value of such enrichment is debatable, since the reduction in coke consumption is barely sufficient to offset the cost of the oxygen. Moreover, the use of an enriched blast raises the temperature of the furnace opposite the tuyeres, and for some purposes that is undesirable.

Enrichment with oxygen may make the furnace work faster and permit the use of lower grade coke, but it is liable to have a deleterious effect on the product and may also interfere to some extent with the blast furnace gas, which is extremely useful as a fuel throughout the steelworks.

These are among the reasons why research has largely been confined to blast furnaces producing ferro-manganese, where both temperature and coke consumption are relatively high. It is also possible that enrichment with oxygen might prove successful in the field of high-grade ferro-alloy manufacture for products such as ferro-chrome. It was even suggested that attempts to reduce chrome ore to ferro-chrome might be undertaken in a furnace blown entirely with oxygen. This has been shown to be feasible but not economical.

Unquestionably unlimited supplies of cheap oxygen would be a valuable asset to steel producers, but the inflexibility of tonnage plants seems to render them unsuitable for most of the requirements of this industry. The purity of the gas is not of material concern, but the supply would have to be flexible and not too large.

Technical Difficulties

What the industry needs is a small oxygen plant which could operate in the consumer's works and produce gas intermittently at a reasonable price—say 5s. per 1000 cu. ft. Alternatively, its requirements might be met by a system of storage whereby the oxygen could be kept in a gas holder for distribution as required. This involves certain technical difficulties, since the gas is damp, has impurities and rapidly promotes corrosion.

Another obstacle to the profitable use of tonnage oxygen is the progress made during the past 25 years in increasing the speed at which furnaces operate. In general, open hearths are now considerably faster than they were 30 years ago and the limiting factor is the handling of scrap supplies and the general logistics of plant layout. Faster melting would further increase these problems. In many steelworks the use of tonnage oxygen would necessitate extensions to casting pits, scrap yards, etc., and a very large expenditure of capital. It remains to be seen whether the advantages would be sufficient to justify the immense reconstruction programmes.

ACRYLIC RESIN EMULSIONS

Paper Industry Finds Some New Uses

From A SPECIAL CORRESPONDENT

THE paper industry is displaying a growing interest in the use of non-ionic, acrylic resin emulsions for the formulation of greaseproof coatings and as a binder for clays and colours in decorative coatings which must have good resistance to discoloration during ageing.

Suitable acrylic resin emulsions demonstrate high stability under mechanical pressure and excellent tolerance for a variety of inorganic salts. Moreover, films deposited by these emulsions will remain colourless and crystal clear even after ageing, flexible and moderately extensible and elastic.

An American firm, which has pioneered these particular applications of resin in the paper trade, reports that one of its products has been examined as a coating for a variety of papers. By its use, it states, it is possible to produce continuous, completely greaseproof coatings on 60 lb. patent board in one pass at coating weights as low as 1.9 to 2.4 lb./1000 sq. ft.

Coating Weights

Where a partial proofing against grease is desired, good results have been obtained at a coating weight of 0.9 lb./1000 sq. ft. Where the base stock is less porous, deposition of continuous greaseproof films is possible in one pass at coating weights of 1.5 lb./1000 sq. ft. These latter results were obtained on super-calendered bleached Kraft.

When used as a binder for high or low grade clays in pigmented coating compositions for paper, acrylic resin emulsions improve the handling characteristics and stability of the coating dispersion. It is also claimed that addition of suitable emulsions does not raise viscosity appreciably. Thus pastes containing 60 per cent solids exhibit viscosities suitable for use on standard equipment. The films exhibit excellent binding and superior ageing properties.

The acrylic resin emulsion may be modified with starch or casein. Where starch is used, the resin improves flexibility and aids in calendering, but, in general, the properties imparted to the coating by the resin are reduced as the percentage of starch increases. Where casein is employed with resin emulsion as a binder for clay, the resin film contributes superior resistance to yellowing during exposure to ultra-violet light, as compared with combinations of casein and other emulsions used as binders.

There are a number of factors contributing to the success of acrylic resin emulsions in the formulation of paper coatings. For example, the most suitable acrylic emulsions have a 40 per cent solids content and specific gravity 1.08 (25° C./25° C.). They are not affected by many acids, bases, salts and organic solvents which coagulate less stable dispersions.

Necessary Properties

Mechanical stability of acrylic resin emulsions to be used for coating work must be of a high order. Paper makers require that such emulsions should be capable of being passed between the rolls of a paint mill, set barely to pass the emulsion, with essentially no breaking. The resin emulsions should show a high stability with thickness such as concentrated water soluble polymers, e.g., sodium carboxy methyl cellulose.

Suitable emulsions should be capable of being plasticised with other resinous compounds to increase the flexibility of the film, without sacrificing its excellent ageing properties. Common additives include acrylic resin dispersions, nitrile rubber latex, natural rubber and synthetic (neoprene and GR-S) latices, butadiene-high styrene latex and polyvinylidene chloride latex.

The acrylic resin emulsions chosen for paper coating work should be without effect and indifferent to common pigments, such as chrome yellow, iron oxide, cadmium red, ultramarine blue, phthalocyanine blue, titanium oxide, carbon blacks, chrome oxide and organic red. Starch and casein must have no deleterious effect on the emulsion, which should mix readily with these substances.

Success in coating paper with formulations containing acrylic resin emulsions of the non-ionic type depends, of course, on a number of variables, among them being such things as the degree of porosity of paper stock, maintenance of a proper balance of coating, viscosity and solids, and proper control of bubble formation by adding such compounds as capryl alcohol.

Fluorine & Nickel Hazards: the Medical View

THE need for rigorous precautions when handling chlorine compounds was stressed by Dr. Donald Hunter at a conference held in London last month under the auspices of the Medical Research Council.

Dr. Hunter was speaking on fluorosis and beryllosis as industrial and community health hazards, and a summary of his paper, and of others, is published in the *British Medical Journal* (April 15, p.899).

The worst danger arose from the volatility and extremely corrosive nature of the vapour of anhydrous hydrofluoric acid. Both hydrofluoric acid and fluorine, if inhaled, attacked the larynx and trachea. The ultimate result was slow ulceration of the gums, nasal mucosa, larynx, bronchi, and conjunctivae. Dr. Hunter advised that locally applied exhaust ventilation should be used to remove gases as near to their point of origin as possible, and mechanical methods substituted for hand labour.

Fluorescent Tubes

A considerable hazard existed in preparing and mixing the powders which coated the tubes of fluorescent strip lamps and certain tubes used for electric signs. The compounds involved were zinc beryllium manganese silicate, zinc beryllium silicate, and beryllium oxide.

There were many reports of dermatitis and acute respiratory illness occurring among workers handling beryllium compounds. Dermatitis might be severe, and sensitisation, once established, was permanent. Pulmonary lesions were much more severe and disabling.

Workers should be seen at regular intervals by a doctor and repeated medical and X-ray examinations should be made of all workers with unexplained symptoms, particularly respiratory symptoms.

The existence of the hazard of non-occupational beryllium poisoning in the neighbourhood of factories presented a challenge not only to the guardians of health in industry but to public health authorities in industrial communities.

Use of BAL

The use of experimental pathological techniques for the assessment of the toxicity of chemical compounds was the subject of a paper by Dr. John Barnes, director of the MRC Toxicology Research Unit.

Dr. Barnes referred to some current work on the use of BAL (dimercaprol) in nickel poisoning. Experimentally it was found that rats poisoned by nickel carbonyl were made worse by BAL; rats poisoned by nickel sulphate by injection were not benefited by BAL, and rabbits poisoned by nickel sulphate were saved by BAL. Thus, is was not known yet whether BAL would make a poisoned man better or worse.

In the past BAL had been used first on man in cases of metal poisoning and the point of his remarks was not directed at all against the value of this substance. It did, however, emphasise the difficulties of interpreting laboratory experience in terms of clinical practice.

India's Steel Programme

ONE MILLION tons of steel is India's production target for 1950. The Government, having considered a report by three steel companies, has decided to establish steel works in the Madhya Pradesh and Orissa; it has also sanctioned a loan of Rs. 5 crore to the Steel Corporation of Bengal, which plans to increase production by 200,000 tons. The Tata company also is considering expanding its capacity.

It is foreseen that steel imports this year are likely to be less than in 1949, owing to foreign exchange difficulties.

Scarcity of iron and steel continues to be acute. The production of finished steel in 1949 was about 922,000 tons and India imported 400,000 tons, mainly from the U.S.A., the U.K. and Belgium.

Power Alcohol in Bombay

THE Central Distillery of the Bombay Government, at Nazik, is expected to start production of power alcohol this year. It has progressively curtailed the production of liquors since the gradual introduction of prohibition in the State, and now manufactures rectified and denatured spirits.

Part of the machinery to produce power alcohol has already arrived and the target committee at its first meeting in New Delhi, recommended the production of 7 million gal. this year.

In 1949 the industry produced 4 million gal. and, if raw materials are adequate and transport facilities improve, it is believed that this figure can be increased to 8.4 million gal. this year.

SYNTHESIS & DERIVATIVES OF ACROLEIN

Full Review of Recent German Advances

THE considerable advances in the synthetic production and modification of acrolein, $C_3H_4O.CH_2 : CH.CHO$, and its derivatives have been reviewed by Doctors H. Schulz and H. Wagner, of the German Degussa research laboratories. A comprehensive review has been prepared of the work performed in the Frankfurt laboratories. It consists of five parts, of which the first is concerned with acrolein itself and the α = alkyl homologues (*Agewandte Chemie* 1950, 62 (5) 105-18).

A brief historical introduction contains some notes on progress in the U.S.A. and Germany, also on the method of Zimakov and Pokrovski in Russia, by which yields of 83 per cent were obtained with allyl alcohol as starting material and powdered silver as catalyst at 200° C.

The Shell Development Corporation, in U.S. Patent 2,451,485 used propylene and steam, with 0.4 per cent Cu_2O on carborundum as catalyst; the yield was 65 per cent. The authors' own experiments, beginning about 1936, in synthesising acrolein from formaldehyde and acetaldehyde are described in some detail, including the pilot plant erected in 1940-42, having a capacity of 10 tons per month, and using silica gel impregnated with 10 per cent sodium silicate as catalyst, at an optimum temperature of 300-320°C.

Reaction Products

In regenerating the catalyst with steam and air, temperatures up to 500-550° C. could be safely used. Yields were 72-75 per cent of theoretical based on formaldehyde and 79-82 per cent in respect of acetaldehyde. Reaction products included methyl alcohol and croton-aldehyde. By addition of inhibitors (0.1 per cent hydroquinone or pyrocatechol) the acrolein could be kept stable for a year or more, as Moureu has also suggested.

The third section, on derivatives, comprises the major part of the paper, and deals at length with eight classes of acrolein derivatives: acrylic acid, polyalcohol ethers, allyl alcohol, glycols and polyamines, chloro compounds, dimers, and β-picoline.

In regard to acrylic acid, various oxidation methods, such as those of the Acrolein Corporation and Distillers Company, in U.S.A., and relative patents are noted. The present authors could achieve little success with molecular oxygen. Other possibilities were conversion into higher oxidation stages—avoiding peracids, and recovery of the vinyl group by controlled oxidation (blocking the double bond). Better success was obtained by utilising the affinity of acrolein for alcohols, and the various stages whereby acrylic acid ester was obtained are schematically shown and some of the relevant Degussa German patents and applications indicated (1938).

It was anticipated from the pioneer work of Sabatier and Senderens that production of allyl alcohol from acrolein by selective hydrogenation would present difficulties, and that propionaldehyde or propanol was more likely to result.

Allyl-Alcohol

It appears, however, that Dr. Brendlein, in the Degussa laboratories, has at length succeeded in finding a catalytic method for the selective hydrogenation of α-β unsaturated carbonyl compounds by which acrolein or crotonaldehyde, up to 40-70 per cent theoretical, may be converted into allyl-alcohol or crotyl-alcohol, while about 20-50 per cent is reduced to the saturated alcohols. (Degussa pat. appl. 19.12.1942).

Before considering the fourth sub-class—glycols and polyamines—it is well to recall that either the carbon double bond or the carbon-oxygen double bond reacts, according to the kind of addendum. Thus the halogens or their acids attach to the former, while HCN adds on to the latter: and hydrogen attaches to both, *e.g.*, with allyl alcohol as an intermediate in the reduction.

With the higher unsaturated aldehydes, similar in properties to acrolein, an aldol condensation is readily obtained by the removal of water from two molecules by a suitable agent.

In the present Degussa work, reference is made to what is described as the beautiful experiment of Späth with croton aldehyde and aldol (*Ber.*, 1941, 74, 859-866, etc.) with formation of a dialdane. In research along somewhat similar lines, Prof. Helberger obtained from hydracrylaldehyde a 3-formyl-4-oxytetrahydropyrane which could be hydrogenated and reduced to the corresponding glycol. The pyrane may also be considered as a condensation of acrolein with hydracrylaldehyde and hydroxyl addition to the double bond.

Besides the tetrahydropyrane glycol, other heterocyclic compounds are present in the high boiling fraction. From the oxytetrahydropyrane there may also form, through aldoxane as an intermediate, a 3-formyl-5,6-dihydro-α-pyrane. This latter formed the base of the 1.6-dimethyl derivative obtained by Späth from dialdane by treatment with concentrated HCl. Relevant structural formulae are given in the original. The formation of polyamines, *e.g.*, 1.3-propylenediamine, by reaction with ammonia and hydrogenation is briefly noted.

Many Derivatives

Other derivatives described, together with structural formulae and methods, are: α-chloracrolein, α,β-dichlor-isobutyraldehyde, 2-chlorpropanolal, several homologues and derivatives of dimeric acrolein (2-formyl-2,3-dihydropyran) starting with the Tischtschenko reaction, and following with 2-methylol-tetrahydropyran, 1.6-hexandiol, 2-oxy-adipinaldehyde, 1.2.6-hexantriol, 2-oxy-hexamethylenediamine-1.6, amino derivatives of the 2-formyl compound, and diene syntheses of acrolein with acrylnitril and methylacrylate; and β-picolin.

In the study of polymolecular reaction products were included both the polymeric possibilities and the acrolein-pentaerythrite condensation products.

As to the former, in addition to the three known methods mentioned in the literature, the authors found that molecular increase can be effected with alkaline agents in the absence of water. With the addition of only traces of potassium carbonate or hydroxide (as an alcohol solution) to pure acrolein distilled under nitrogen, there is fierce evolution of heat and explosive reaction and a solid yellowish resin is formed.

Various forms of the reaction are discussed and, in connection with the tendency of acrolein to form hydropyran rings, it is suggested that the alkaline-induced polymerisation constitutes a continuous interchange of α-C condensation and hydroxyl group addition to the double bond of the nearest acrolein molecule. A proposed structural formula for this is given.

In regard to the acrolein-pentaerythrite condensation, the course of the reaction was studied in two stages, the first being pre-condensation and the latter resinification (see also Degussa, Ger. pat. appln. D 84823 of 9.4.41).

In the first the essential part is formation of cyclic acetals, for which the structural reactions are shown. The condensate is a more or less viscous liquid which in course of time, according to temperature, forms a solid resin. Under suitable conditions that change can be indefinitely deferred.

A rather remarkable macro-molecular formation is shown after removing water of reaction, and distillation in vacuum, whereby the double bonds of the cyclic acetals in the presence of acid catalysts could link up available hydroxyl groups (of unreacted pentaerythrite and allylidenepentaerythrite) with linkage over ether-oxygen bridges; the whole forming a system of m-dioxane rings and methylethyl-ether bridges.

In the experimental part are described in detail the methods for preparing the various products, beginning with acrolein itself, methyl and ethyl acroleins, methoxy-propionaldehyde, etc., and concluding with the acrolein-pentaerythrite resin, a modified resin, and two allylidene-pentaerythrite products.

The a.-p. resin is prepared from freshly distilled acrolein (350 g.) and pentaerythrite (510 g.), the former being distilled in a nitrogen stream in a flask with thermometer and reflux. After addition of 2.8 g. of p-toluol-sulphonic acid in 5 c.c. water the mixture is heated to 75-80° and stirred for 1½-2 hr., with care to maintain an inert nitrogen atmosphere.

The reaction water is distilled off *in vac.* The viscous condensate is poured into a mould and hardens at 60-80° in 12-24 hr., and there is a loss of volume of about 15 per cent.

Behaviour With Solvents

The mechanical and electrical properties of the resin are tabulated and its behaviour with solvents and aqueous solutions. The modified resin is prepared with butanol or a fatty acid mixture by heating for an hour or two and hardening for 20-24 hr.

The diallylidene-pentaerythrite product is prepared by heating 448 g. acrolein and 136 g. pentaerythrite with 1.5 g. oxalic acid and stirring for 19 hr. in a reflux condenser, neutralising with $NaOH$, distilling off the reaction water and excess acrolein and fractionating the residue *in vac.*

The first fraction comes over at 107-115° and yields 168 g. of the diallylidene product; the second (115-155°) is 25 g., and the residue 32 g. By re-crystallising from 60 per cent aqueous methyl alcohol an m.p. pure product is obtained. The yield is 67.4 per cent, reckoned on the initial acrolein. A similar method is used for the allylidene-pentaerythrite, using 0.07 g. of p-toluol-sulphonic acid. Two acetals (methoxy- and acetoxy-) were also prepared from the di-allylidene material.

ADVANCING WOOL CHEMISTRY

Successful Application of Research

From A SPECIAL CORRESPONDENT

DISCOVERIES, many of them leading to new processes and fresh sources of industrial materials, are being continuously derived from current scientific scrutiny of the wool industries. Most of this is chemist's work, either in the production of new substances facilitating wool processes, of which the development of colloidal silica to serve as an " anti-lubricant " was a recent example, or the recovery and modification of waste products, such as wool grease.

The readiness of this department of research to take advantage of any aid in science or technology has lately been attested by the use by Dr. A. B. D. Cassie and his assistants at the Wool Industries Research Association Laboratories in Leeds of radioactive isotopes from Harwell. These are being employed in fundamental studies of the mechanism of wool dyeing.

A close watch for developments of potential commercial value is maintained by the International Wool Secretariat, formed by producers in the Dominions and the United States to promote the use of wool. One of the principal functions of this body is to increase the efficiency of wool as a textile fibre by the promotion of research of all kinds and the improvement of manufacturing processes.

The International Wool Secretariat promotes such research by means of scholarships, fellowships and grants to appropriate institutions, in Britain to the Wool Industries Research Association at Leeds and the Department of Textile Industries at Leeds University. Soon, research financed by the Secretariat will be started in Switzerland and possibly in the Western zone of Germany.

Research Results

As part of its technical information service, the Secretariat holds exhibitions of new developments, based on research discoveries which are of practical value to textile manufacturers.

In many of the processes by which wool fibres are manipulated—such as carding, combing, drawing, spinning, etc.—the individual wool fibres are required to slip over one another in a controlled manner. The traditional methods of processing involved the control of this friction between fibres by the addition of such substances as olive oil or oleic acid, which, on storage, thicken and therefore increase the "drag" of one fibre over another

A more convenient means of controlling this property is the application of the colloidal solution of silica (Monsanto Chemicals' Syton). This material consists of a stable dispersion of sub-microscopic particles of silica in water. The particles are about 1/400,000 of a centimetre in diameter and are non-crystalline in appearance. Relatively small amounts, placed on wool fibres, increase the drag and enable them to slip past one another at constant speed.

Increased Production

In worsted manufacture, this increased coefficient of friction can be used in several ways. It permits spinning to a finer count, procures fewer yarn breakages in spinning to a given count, and reduces the twist needed in the yarn for a given strength. Thus production is increased and there is less waste.

In woollen manufacture a suitable addition of the silica dispersion may increase the breaking strength of the spun yarn by 10 to 30 per cent. The silica is completely removed by mild piece scouring.

Another relatively new substance whose commercial use has been furthered by the wool industries is alginic acid, extracted from certain kinds of seaweed. After conversion to calcium alginate, it forms a synthetic fibre which, though reasonably strong when dry, dissolves completely in warm solutions of alkali.

The use of this type of rayon to produce lightweight and novel fancy fabrics is well known; a newer interesting application is in the manufacture of men's seamless socks. These are usually knitted one after the other, end to end, and the hand cutting employed to separate them sometimes produces an unfinished edge to the sock. In the new method, a few rows of stitches between the socks are knitted in alginate rayon and when the finished goods are washed in the final processes the alginate dissolves.

The traditional use of chlorine in wool treatment is primarily to increase resistance to felting during laundering. Another unexpected advantage now makes the chlorine process even more attractive. It is easier to wash oil-bound dirt from chlorinated wool than from untreated wool. The original surface of a wool fibre is atractive to oil but repellent to water. After chlorination, however, the wool becomes attractive to water and therefore repellent to oil and the latter then offers little resistance to detergents.

Raw wool may contain from 6-50 per cent of wool grease, the removal of which during scouring gives rise to factory effluents of a kind which in some countries may not be discharged to sewers or rivers.

Wool Grease

That crude wool grease can be refined to give substances like lanoline, or can be compounded into paints and other industrial products has been well known and the practical development of the principle was stimulated by the war. Wool grease can, for example, yield one of the most efficient rust preventives known. This was employed very extensively during the war on Allied military equipment in the humid atmospheres of tropical countries.

More recently, it has been found possible to separate some of the pure chemical substances present in the original mixture. Using these as raw materials, new departments of organic chemical industry may be established. The beginning of such development can already be discerned.

Much wool grease is recovered from sewage at a central works in Bradford, but it is very dark in colour. Nevertheless, it is affording an effective starting material for the production of drying oils suitable for paint manufacture, washable water paints, railway wagon axle grease, etc. Direct separation of the grease from wool scouring liquors, either by acid cracking with sulphuric acid, or by centrifuging, is giving a lighter and purer product, from which are prepared the fine grades of lanoline used in pharmacy and to form the base of many kinds of cosmetics.

Lanolin

Lanolin consists chiefly of a complex mixture of esters formed by a combination of the alcohols cholesterol, *b*-cholesterol, agnosterol and lanosterol, together with some 30 different acids. The character of these acids is still presenting considerable problems to organic chemists. It is in connection with the cholesterol constituent, which forms 15-20 per cent of the lanolin, that most commercial developments have taken place.

By new methods, sometimes using an addition compound of oxalic acid, cholesterol can be prepared in 100 per cent purity. Such vital materials as vitamin D and the sex hormones, testosterone, progesterone, etc., which have wide clinical uses, are now synthesised commercially from cholesterol. Sex hormones previously have been obtained by a laborious process of extraction from the glands of animals.

The separation of lanolin from wool grease has been carried on as a commercial process for many years and the use of the former as a base for cosmetics is general. An unforeseen development in this field was the exploitation by some wool manufacturers of the possibilities of turning the wool grease from their own scouring departments into cosmetics. In the U.S.A., Botany Worsted Mills, Inc., making fine quality worsted fabrics, is employing the recovered wool grease to make high grade cosmetics.

The control of clothes-moths and the mothproofing of woollen garments are problems to which the attention of chemists has long been directed.

It is generally supposed that the unique ability of moth grubs to digest wool is due to the presence in their intestinal tract of an enzyme capable of breaking the disulphide bond, the special linkage in the wool molecule which is largely responsible for the strength and insolubility of wool fibres.

Novel Moth Proofing Method

A novel method of mothproofing has, therefore, been proposed, in which a proportion of this bond would be chemically replaced by an entirely new—and indigestible—linkage. The Disulphide linkage,

$$C - CH_2 - S - S\ CH_2 - C$$

would give place to

$$C - CH_2 - S - CH_2 - S - CH_2 - C.$$

This change had previously been made in the laboratory by reduction with calcium thioglycollate followed by relinkage with methylene dibromide, but such costly reagents made the process impracticable from a commercial standpoint. Recently, however, cheaper reagents capable of producing the same change have been suggested; *e.g.*, sodium hydrosulphite and formaldehyde. This method is not yet known to be in commercial use and it is not certain what other slight changes in colour, handle, etc., might be simultaneously produced, although laboratory experiments do not suggest there would be any severe deterioration.

Should such a process prove successful, it would give protection as permanent as the life of the fibre itself. It is probable, too, that wool altered in this manner would have increased resistance to attack by alkalis in scouring or laundering.

ISOLATION OF VITAMIN B12

Another Red Factor Separated

by Dr. E. LESTER SMITH*

THE efficacy of liver in treatment of pernicious anæmia was discovered in 1926, but it was not until 22 years later that the active principle—now known as Vitamin B_{12}—was isolated in crystalline form.

In 1948 the achievement was announced independently by Folkers and his co-workers in America and Lester Smith in Britain, within a few weeks of each other. Much delay was caused by difficulties in testing and the need for clinical evaluation, and microbiological assay has only recently been available. (Shorb, in America, used *lactobacillus lactis* Dorner as the test organism).

Owing to absence of particular chemical properties, the vitamin has had to be isolated from liver by methods almost exclusively physical. These included adsorption (charcoal or alumina) and partition chromatography (using damp silica and butanol). In the latter method, three coloured zones were obtained; brown at the top, pink in the middle and yellow at the bottom. Dr. C. C. Ungley found by clinical tests that nearly all the activity was concentrated in the pink fraction, which indicated the further work.

Purification Difficulties

Persistent peptide impurities impeded further progress until they were destroyed by protolysis, using trypsin; after further lengthy purification by chromatographic methods and subsequent concentration the pure vitamin was ultimately obtained as deep red crystals from aqueous acetone. The immensity of the task can be appreciated when it is known that 1 ton of liver was required to give 15 mg. of pure vitamin B_{12}.

The substance has a phenomenal potency producing haemopoietic response in pernicious anaemia in doses of about 0.001 mg.; folic acid of 5000-10,000 times this amount is needed for the same response.

A remarkable feature of this vitamin is that it contains about 4 per cent of cobalt, this being the first time that the metal has been found in a pure material of biological origin.

The most characteristic physical property of this substance is its absorption spectrum; X-ray crystallography has confirmed its molecular weight of 1650 100 for the hydrated substance. The chemical formula is given as

$$C_{61-64}H_{88-92}N_{14}O_{13}P\ Co$$

The research work on the animal protein factor has shown that it could be synthesised by certain intestinal bacteria.

This led to the possibility of its being produced by fermentation methods and it has been discovered that it can be synthesised by *streptomyces griseus,* which is used in the commercial preparation of streptomycin. Industrial preparation of purified vitamin B_{12} concentrates from this source is now in operation here.

Vitamin B12b

Interest in the work on anti-pernicious anæmia did not slacken with the isolation of vitamin B_{12} and already another red factor, vitamin B_{12}b, also clinically active, has been separated, using chromatographic techniques.

In the discussion which followed, both Dr. Herd and Dr. Pankhurst asked about the loss of the vitamin on charcoal and Dr. Lester Smith replied that little was known about resulting inactivation which might be due to destruction or irreversible adsorption; X-ray methods might have given information about the structure of the molecule.

Mr. Garrod was informed that absorption spectra technique was not suitable for assay purposes, because of interference by other substances present.

The function and mode of action of vitamin B_{12} in the human body was raised by Dr. Young, who was told that the vitamin seemed to be necessary for normal nutrition and is concerned in some manner with the replacement of the red blood cells. Even pernicious anæmia patients excrete vitamin B_{12} but suffer from some form of stomach atrophy which prevents absorption by the intrinsic factor.

Dr. Lester Smith also disclosed that he and Dr. Ungley had been working on yeast extracts which undoubtedly contained a potent anti-pernicious anaemia substance which was not vitamin B_{12}. More work on the Wills factor was needed.

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* Summary of a paper presented before the London and South-Eastern Counties Section of the Royal Institute of Chemistry at Acton Technical College on February 14. The chair was taken by Dr. C. W. Herd.

DRUGS AND FINE CHEMICALS IN 1949—V

Popular Adoption of Antihistaminics

by G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

THE second development of importance in the antihistaminic field during 1949 has been the application of these drugs in the treatment of the common cold.

The development is derived from the initiating work of J. M. Brewster, which was carried out at a U.S. Naval Hospital. Since his findings were made known this use of antihistaminics has been the target of a fantastic degree of non-ethical commercial exploitation in U.S.A.

Effects of Benadryl

Impressed with features which were characteristic both of allergic reaction and the early stages of the common cold, Brewster was led to explore the effects of benadryl (the dimethylaminoethyl ether of benzhydryl) in the latter and his first results were reported in 1947 (*U.S. Nav. Med. Bull.*, 1947, *47*, 810). He later carried out a more comprehensive series of tests and these were presented during the past year (*U.S. Nav. Med. Bull.*, 1949, *49*, (1), 1). A number of antihistaminic drugs were tested under controlled conditions.

Brewster reached the conclusions that the common cold is an allergic reaction in the initial phase and, provided antihistaminic drugs were administered *during the initial phase*, the common cold could be aborted with a high degree of success. The effectiveness of the treatment was found to be inversely proportional to the lapse of time between the onset of symptoms and the administration of the drug.

Brewster's theory is that the cold is checked when the administered antihistaminic drug reverses the allergic reaction before the mucuos membrane becomes damaged and the protection it affords from pathogenic organisms is lost. He points out that a common cold provides immunity lasting from three to seven weeks, and this immunity was reported to develop even when the cold was aborted by the antihistaminic drug. But the " cure " of a cold was found to be increasingly difficult with the lengthening of period since the last attack and, lacking immunity, it was found necessary in such cases to repeat the dose of antihistaminic drug at intervals of 2-5 days, especially during times of epidemic. Brewster actually suggests that it might be more satisfactory to *select* a cold of a mild variety in order to build up immunity.

The " cold-cure " market is of unique dimensions in any country, and it is not surprising that in America many commercial organisations found this new field of therapy immediately ready—if not quite ripe— for the harvesting. In that country the cold-remedy market has been estimated to be worth $100 million per annum and it is claimed that in four weeks sales of one of these new proprietary products totalled $1 million.

The rush to manufacture drugs of this group precipitated acute shortages of intermediates, especially of lithium amide, which is required as a condensing agent, notably in the manufacture of pyribenzamine, which may be taken as a typical example of compounds of the antergan type.

The demand for lithium amide has been reported to have increased twentyfold over the past year. Other drugs reported to have been in demand as intermediates are anisic aldehyde, α-aminopyridine, thionylchloride, diethylaminoethanol, thiophene, etc.

U.S. Publicity

A vast amount of publicity has been given to these drugs in U.S.A. and the basic merit, the requirements for satisfactory therapy and the dangers of indiscriminate use of these drugs have been lost sight of. Some ethical pharmaceutical firms resisted the " stampede " and, having received permission from the Food and Drug Administration to market their proprietaries over-the-counter, have elected to market them ethically on prescription only; other ethical pharmaceutical firms have formed subsidiary companies for the sole purpose of exploiting the field through non-ethical channels.

Some firms are reported to have offered the same antihistaminic drug under different names, one for sale on prescription only and the other for drug store sales. In most cases the dose of antihistaminic drug in the over-the-counter packs is 1/5th to ½ that of the corresponding proprietary pack.

The drowsiness which is a common side-reaction of such antihistaminic drugs

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The previous article appeared in THE CHEMICAL AGE, 62, 382.

varies according to the formulation and the susceptibility of the patient.

The tendency to promote drowsiness has admittedly been much reduced in the more recently introduced antihistaminics, but it appears not to have been entirely eliminated. The sales of these preparations direct to the public with dosages adjusted well below the therapeutic optimum further reduces the risks of mass self-medication.

In various proprietary presentations U.S. drugs have been compounded to counteract the drowsiness likely to be caused by antihistaminics employing amphetamine, caffeine and aminophylline, etc. These drugs, of course, carry their own inherent risks.

An increasingly popular polypharmaceutical is the combination of an antihistaminic drug with the well-established analgesic/antipyretic combination of aspirin, phenacetin and caffeine.

The medical profession in U.S.A. is strongly opposed in principle to " off-prescription " sales of drugs of this group. Against this is the practical issue that the drug must be administered most promptly and preferably within one hour of the onset of the symptoms of the cold for maximum effectiveness. The American medical profession stresses that the usefulness of the drugs has not been fully determined nor their ill-effects fully assessed.

The Food and Drug administration has been severely criticised for its apparent leniency in permitting the unrestricted direct sale of these drugs, but it appears to have done all it can within the law and the facts. Some restrictive legislation is considered not unlikely.

Allergic Asthma

In the United Kingdom, as elsewhere, various ethical proprietary brands of antihistaminic drugs have been available for many years and their principal field of usefulness has been in allergic reactions generally and especially in the treatment of allergic asthma. A demand for these existing products over recent months for cold remedies has been reported, but no attempt appears to have been made by manufacturers to exploit their reputed value as cold remedies by direct public advertising. U.K. manufacturers of antihistaminic drugs appear generally to have shown commendable caution in themselves seeking restriction by the authorities to ethical channels of distribution.

It is interesting to record in passing that, in recent weeks, a motorist has been fined and prohibited from driving for a period because of dangerous driving under the influence of an antihistaminic drug.

The use of these antihistaminic drugs poses not only problems of technical interest but touches the roots of ethicality, both in the practice of medicine and in the marketing of pharmaceutical products. It will be of interest to see at what point the conflicts are reconciled and observe the repercussions on the U.K. market.

Vitamin B_{12}

Considerable strides have been made during 1949 in the characterisation and chemistry of the antipernicious anæmia factor, Vitamin B_{12}, which was isolated simultaneously by E . Lester Smith at the Glaxo Laboratories in U.K. in 1948 and by a group of Merck workers led by Rickes in U.S.A. The drug was found remarkable for the minute dose, amounting to a few micrograms, which produces remissions in pernicious anæmia, sprue and nutritional microcytic anæmia. These conditions were previously treated first with massive oral doses of liver and latterly by injections of liver concentrates.

Lester Smith, who has been so closely concerned with these developments, has contributed a valuable paper, striking in its comprehensiveness, conciseness and modesty on the " Crystalline Anti-Pernicious Anæmia Factor " (*Brit. Med. J.*, 7/12/49, 1367) in which he offers a historical survey of the developments which led to the isolation and characterisation of Vitamin B_{12}.

Minot and Murphy first discovered the effectiveness of liver extract in pernicious anæmia in 1926, but progress was held up for two decades or so because the only means of assay was on clinical cases in which the technique is always tedious and time-consuming. Most of the assay work conducted in hospitals on clinical cases was of an unprecedented precision. The American workers, however, were able to develop a microbiological assay technique based on the fact that Vitamin B_{12} was an essential growth factor to *Lactobacillus lactis*, Dorner (Rickes et al., *Science*, 1948, *107*, 396; Shorb, *Science*, 1948, *107*, 397).

Numerous attempts were made to concentrate the anti-pernicious anæmia factor of liver during the decade following the basic discovery of Minot and Murphy. The methods used followed well-known biochemical procedures involving solvent extraction and precipitation with solvents and/or heavy metal salts, usually at a controlled pH.

In 1936 absorption techniques were brought into use and Strandell and Kelm were able to prepare fractions which were clinically active in doses of about a milligram (*Acta med. scand.*, 1936, *88*, 620).

Such concentration was an important advance, especially when it is remembered that there is less than 1 gram of the factor in 4 tons of fresh liver. In the paper referred to Lester Smith generously acknowledges that the work of Strandell and Klem formed the foundation of the subsequent work by himself and his colleagues.

Emery and his co-workers (*Brit- Med. J.*, 1945, i, 75, *Biochem. J.*, 1945, 40, iv) provided the next step in concentration, still using known techniques dependent upon adsorption on carbon, elution with phenol or hot 65 per cent alcohol and salting out with ammonium sulphate.

Chromatography Techniques

Lester Smith and his colleagues achieved the next advance by exploring the use of newly elaborated partition chromatography techniques with concentrates first provided by the classical methods of concentration. Strikingly, the factor appeared to be concentrated in one pink band and this afforded a great advantage in isolation . These workers subsequently passed through a phase of discouragement in which a factor was the discovery of folic acid (dealt with fully in previous reviews) which, at first seemed to be the anti-pernicious anæmia factor. Later investigations, however, showed this was not so. and in particular, that folic acid failed to prevent the sub-acute combined degeneration of the spinal cord, which ultimately leads to a fatal outcome in pernicious anæmia.

As the chromatographic technique was improved it was realised that still further concentration would have to be achieved in order to crystallise the factor. This was secured by the adoption of a proteolytic enzyme digestion with trypsin, or the like, to break down peptide impurities. Further chromatography after enzymic digestion eventually led to the crystallisation of Vitamin B_{12} from acetone.

The factor appeared in the form of bright red needles which appeared almost black in bulk. The absorption spectrum in aqueous solution shows three well marked absorption bands at 278 mμ and 361 mμ and 550 mμ. Lester Smith, in his paper, stresses that the technique used for the isolation of the factor was almost entirely physical and this was necessary. because the factor was " singularly devoid of characteristic chemical properties."

The isolation of the anti-pernicious anæmia factor, combined with elaboration of microbiological assay techniques. has afforded the opportunity of standardising liver extracts and concentrates in terms of Vitamin B_{12} activity which, in itself, is a great advance.

Simultaneously, Ungley, of the Royal Victoria Infirmary, Newcastle-upon-Tyne, with statistical assistance from Campbell, began the long and elaborate series of 84 clinical tests with various of the Glaxo isolates on patients with pernicious anæmia in relapse (*Brit. Med. J* ., 17/12/49, 1370).

Conclusions were arrived at on the basis of a number of responses at each dosage level 1.25—160 μg) the response being measured mainly by the increase in red blood cells. In 32 cases the amount of vitamin B_{12} required to give satisfactory red blood cell counts and remission varied between 15 to 140 μg, and the time required was 15 to 118 days. It was found that it was economical to administer a given amount of the factor in divided doses at fortnightly intervals rather than in a single large dose.

Ungley found that within the first few days of the treatment patients showed a dramatic response including an increase in appetite and well-being and, later, a gain in weight. There appeared to be no unpleasant side-effects and sensitiveness to the drug was not encountered.

Maintenance Requirements

It is too early to be clear what are the maintenance requirements and, indeed, such information as exists seems to indicate that patients show great variability in this requirement.

So long as the supply of vitamin B_{12} is dependent upon the use of liver as a raw material its production is likely to be hampered for obvious reasons. It is, therefore, encouraging that, arising from work on the " animal protein factor " required by chicks reared on a vegetable-protein diet, it appeared that the essential factor was synthesised by intestinal bacteria and, consequently, thought was turned to the possibility of preparing the factor by a microbiological process.

(*To be continued*)

Aureomycin as Growth Stimulant

THE claim that aureomycin, hitherto known for its anti-infection properties, is also a potent growth promoting substance was recently made by the American Chemical Society.

The report of two research chemists, Dr. E. L. R. Stokstad and Dr. T. H. Jukes, both of the American Cyanamid Company, states that 5 lb. of an unpurified substance on which the aureomycin fungus grows, when mixed with 1 ton of animal feed, increased the rate of growth of hogs by as much as 50 per cent.

Tests are being carried out to determine whether the drug is equally effective in stimulating the growth of children.

OVERSEAS CHEMISTRY AND INDUSTRY

GROWING OUTPUT IN BRAZIL

Industrial Acids and Fertilisers and Sodium Chemicals

THE rate of growth of Brazilian chemical industries is indicated by the widening variety and bulk of industrial acids coming from home plants, enlarged last year by the inauguration of two new factories producing sulphuric acid and explosives.

Although U.S. sulphur remains the essential for much of the national sulphuric acid production—writes our correspondent in Teresopolis (Rio)—some production is now employing local pyrites and process waste gases. Current investigation aims to provide means of benefitiating pyrites in the coal fields in the interest of fuller production of sulphuric acid.

Abundant raw materials for fertilisers exist and are being increasingly exploited by private enterprise and the Ministry of Agriculture. Apatite occurs in limestone deposits in four States, the reserves in Minas Geraes, alone, being estimated at 100 million tons. In Maranham, in the north, experiments are being carried out to produce phosphoric acid and soluble prosphates in electric furnaces from phosphoric bauxite.

During 1950 the Department of Mineral Production will investigate the prospects of recovering potassium salts as a subproduct of the salt mines, and the concentration of nepheline and leucite for subsequent extraction of potassium salts. Lime is found in all but two Brazilian States, and deposits of nitrate have recently been registered by the State Museum in Goiás. The nitrate is reported to be of excellent quality, but no information is yet available regarding the extent of the reserves.

Considerable advance was made last year in the manufacture of chemical fertilisers. Several firms increased their output and two new companies were organised to prepare phosphates and potassium.

Caustic Soda Development

Towards the end of 1948, under the auspices of the Council of Mines and Metallurgy, three Brazilian companies concluded an agreement for the joint exploitation of the industry of caustic soda and derived products. The companies were: Industrias Brasileiras Alcalinas S.A. (IBASA), Companhia Salgema, Soda Caustica e Produtos Quimico (Salgema), and the Companhia Nacional le Alcalis (Alcalis).

IBASA is a subsidiary of Losanac, Montreal, and of the Solvay American Corporation, affiliated to Duperial. Salgema was formed in 1941 by the administrator of properties taken over by the Federal Government.

Alcalis was founded in 1943 by the Federal Government with a capital of 50 million cruzeiros (£950,000 present exchange), of which 26 million were subscribed by the Government National Salt Institute.

Long-Term Project

Under the 1948 agreement IBASA is authorised to exploit for 80 years the rock salt deposits at Contiguibá, in Sergipe, which belongs to Salgema, giving loans to the latter as compensation. Alcalis participates indirectly in the agreement and may exploit the deposits situated outside the zone reserved to IBASA.

During 1949 Alcalis completed its preliminary studies and plans for Brazil's first factory to produce caustic soda and barilla (impure soda ash).

A factory is to be built at Cabo Frio, on the coast, 60 miles north of Rio de Janeiro, to produce annually 100,000 tons of carbonate of soda, which will furnish 45,000 tons of caustic soda, 33,000 tons of barilla and other products. About 60,000 tons of caustic soda are now imported annually, but domestic consumption is increasing rapidly.

Salt will be obtained industrially by means of evaporators, employing salt water concentrated to 10 Bé in a pan occupying an area of 100 acres, and afterwards to 25 Bé in one with an evaporating surface of 2.4 million sq. yd.

Lime will be obtained from shells, dredged from the adjoining lake, washed on the dredgers and conveyed by lighter directly to the silos or the furnace mouth. The shells have a carbonate content of 95.40 per cent and reserves are calculated to be 15 million tons. Imported oil will be used as fuel until the national refineries, now building or about to be built, begin to produce.

The company has increased its capital from 50 to 100 million cruzeiros (£1.9 million), and is now waiting to sign the contract for a loan, already approved, from the Export and Import Bank of Washington, for U.S. $7.5 million. This sum will be used to finance imports of machinery and to pay technical staff.

South African Chemical Enterprise

Production of Cyanide From Local Materials

From Our CAPE TOWN CORRESPONDENT

ONE-THIRD of the cyanide used by the gold mines is now being completely produced in South Africa. It is made in the Klipspruit factory of African Explosives and Chemical Industries from locally obtained materials. A feature of this plant is that it uses by-products—in particular methane—of the Klipspruit sewage disposal works that would otherwise go to waste. As a result, 12 mines are being supplied with cyanide essential for their production of gold.

The cyanide leaves the factory in road tankers in solution, as being a convenient form for use in the mines plant, and is delivered into storage tanks constructed at the mines at the expense of the explosives company. The particular product of this factory is calcium cyanide, which has been shown by tests to be as suitable for the mines requirements as the sodium cyanide previously marketed. Some of the mines use " black " cyanide, which is processed in South Africa from imported intermediate materials, but the Klipspruit factory is the first in the Union to make cyanide entirely from local materials.

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A new type of machine for spraying a fog of insecticide for the purpose of killing ticks on cattle is shortly to be put into use in northern Rhodesia. This is claimed to eliminate the need for dipping and to be much more effective. Big advantages are that it can deal with a large group of animals at one time, is easily transportable, and depends only on water supplies. Exhaustive tests have been carried out at the Central Research Station at Mazabuka, with favourable results.

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The S.A. Federated Chamber of Industries will probably urge that the Klipfontein Organic Products Corporation Bill, which has been read for the first time in the House of Assembly, be referred to a select committee before the second reading. The Bill proposes to transfer the State-owned DDT factory near Johannesburg to a public utility corporation, which will manufacture insecticides, and a wide range of agricultural chemical products.

The corporation will have a share capital of £3 million made up of £2 million in ordinary £1 shares to be held by the Government and 1 million ordinary £1 shares to be held by private manufacturers who have established factories on ground owned by the corporation. The Klipfontein factory was built during the war by the British and South African Governments to make poison gas. Later the Union Government took over the British Government's share of the assets, and since the war the factory has been making chiefly DDT concentrates and compounds for general sale.

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In addition to its large enterprise at Saldanha Bay, the Vrany Chemical Corporation of S.A., has begun the commercial production of high-grade salt at Coega, some 17 miles from Port Elizabeth. A relatively inexpensive system of draining the brine in the dry basin at Coega has been evolved. The brine is pumped to the surface and run into large pans. When it is sufficiently concentrated, it crystallises into the salt deposits which are marketed in conformity with the specifications of the S.A. Bureau of Standards. The company has a laboratory at the site and its own electricity power station.

West German Steel

THE production of crude steel by the British zone of Germany reached its highest monthly level in January—907,109 tons. (The previous highest output—844,921 tons—was recorded in August, 1949). The January figure represents an annual rate of 10,850,000 tons; 11.1 million tons is the maximum permitted by the Prohibited and Limited Industries Agreement.

German authorities are reported to be in some doubt as to whether this rate of production can be justified or continued, as the total order book for hot rolled products at January 1—including some 15 per cent of orders for deferred delivery—represented an average of only two or three months' work at this production rate.

No provision has yet been made for implementing the 11.1 million tons restriction, but the Iron and Steel Department of the German Ministry of Economics is preparing a scheme to do this, which will probably require production quotas to be set for each producing unit.

U.K. REFRACTORIES

American Expert's Views

"THE British are doing a creditable job in spite of governmental obstruction, and the scarcity and high prices of raw materials, which are in many cases of inferior quality."

That estimation of the situation of the U.K. ceramic industry was offered by Mr. William S. Debenham, research associate, Research and Development Division, Carnegie-Illinois Steel Company, in the course of a talk to the Pittsburgh Section of the American Ceramic Society.

A year or so ago, Mr. Debenham visited many steel mills in England and Scotland, states *Ceramic Forum*. His principal interest lay in the quality and performance of the refractories used in building blast and openhearth furnaces.

Ceramic research enjoyed Government assistance and considerable work was being carried out in the field of refractories.

The speaker considered the " class system " had practically gone but the idea of small production of quality goods at a high profit persisted. Much of the equipment was obsolescent (no central heating and no private baths). The government bore heavily on the business man; many of the shortages and poor quality of raw materials, in his view, were due to Government controls.

Silica Refractories

Mr. Debenham discussed in detail the manufacture, setting and performance of silica refractories. British steel men were sceptical of low Al_2O_3 in silica brick. Although there appeared to be no correlation with service records, specific gravity was tested rigorously. On to the subject of high Al_2O_3 fire-clay brick he considered most of the clays were poor in quality.

Basic refractories were widely made and used. Because of the shortage of magnesite, dolomite was the raw material most generally used, and in some quarters it was considered to be superior to magnesite. Much fine research work had been done on basic refractories such as spinel and chrome-magnesite. Mr. Debenham specially noted the very modern carbon refractories which are to be used in two projected furnaces in England.

The speaker covered in detail the manufacture of refractory shapes, commenting on the general slowness and small output of operations and, according to American standards, poor firing. The masonry work, however, he considered to be very carefully done, the settings being more precise than in the U.S.A.

GERMAN RECOVERY

Chemical Company's Record

WHAT appears to be an outstanding example of rapid post-war recovery by a German chemical undertaking is recorded in the report commemorating the 85th anniversary of the Badische Anilin und Sodafabrik (BASF) of Ludwigshafen-Oppau (French zone).

The most remarkable single point emerging from this account is that the firm has almost re-established its pre-war export business. Formerly about 40 per cent by value of the total output was shipped abroad; now this percentage has reached almost 30 per cent. Bearing in mind the strong position of the U.S., U.K. and Swiss chemical concerns in world markets, this is a considerable achievement.

Export Recovery

The re-entry of Badische into the export field is even more remarkable because it has been achieved without having at its disposal a foreign sales organisation or agencies abroad. It is stated that this favourable result is due to the incessant work of German business men and technical experts who have visited and advised foreign customers.

The firm considers it particularly gratifying that many customers, said to have been disappointed with products marketed by competitors using confiscated trade marks of Badische have resumed connections with the Ludwigshafen firm. Since the end of the war, about 500 new patents have been registered, but on account of the post-war patent law position, the majority of these were registered in France.

The management expresses its confidence in the future and believes that the firm will maintain its old markets and also enter new ones. In spite of the considerable post-war difficulties connected with clearing up, dismantling and a large-scale explosion, no workers have been dismissed. The firm paid salaries last year amounting to RM 86 million, and no less than RM 12 million in pensions to over 10,000 former employees.

Badische, originally a unit of the former I.G. Farbenindustrie, in 1945 became an independent unit and resumed its former title. Managerial functions and administration are in the hands of the French sequestrator with a staff of some 300 officials and specialists. Reconstruction work following war damage is estimated to cost RM 400 million.

ISRAEL'S POTASH PLANS

State Demands to Concessionaires

THE uncertainty whether exploitation of Israel's potash deposits would be profitable was expressed recently by Mr. D. Z. Pinkas, chairman of the Finance Committee, to the Israeli Parliament.

Palestine Potash had operated at a loss for years, he alleged, because a French-German cartel had undersold it and prices were still controlled by an international cartel.

The Palestine Potash Co., Ltd., he said, had received its concession on January 1, 1930, from the British High Commissioner, representing the governments of Palestine and Trans-Jordan. The company had hoped to raise £1 million. He claimed it had not succeeded in reaching that total.

Production and Profits

Its equipment was primitive, Mr. Pinkas said, and the maximum output was 250,000 tons a year; between 1940 and 1947 profits exceeded £1.5 million. Under the terms of the concession, the governments of Palestine and Trans-Jordan received a five per cent *ad valorem* duty and 40 per cent of the profits before payment of dividends.

The Finance Committee, Mr. Pinkas said, had approved a loan of $2.5 million from the American Export-Import Bank to the concessionaires, on condition that by the end of 1950 the company's registered office be moved from London to Israel, and the chairman and the majority of directors should reside in Israel. The majority of the voting shares should be Jewish owned.

The company must undertake to raise £2 million in foreign exchange for the expansion of the southern end of the Dead Sea works, and for the housing of workers. Fresh water for the desalting of the pans should also be provided by the company.

The Finance Committee had also recommended that the company should agree not to resume operations at the northern end of the Dead Sea (now in Jordan hands).

Trans-Jordan should not put up a rival plant.

The trend towards nationalisation of the Dead Sea potash industry is called to mind by the committee's recommendation that the Palestine Potash Company should be required to agree to negotiate with the Government, on one year's notice, if the latter decided to take over the works.

INDIA'S SURPLUS SOAP

High Costs and Few Markets

THE opinion that insufficient efforts have been made by the Government of India to develop the country's export market for soaps in demand overseas was expressed recently at the 16th annual conference of the All India Soap-makers' Association in Madras.

High production costs, caused largely by the increased prices of raw materials, had made it impossible for Indian soaps to compete successfully with their foreign counterparts, the association maintained, and added that these costs could be substantially reduced if, in pursuance of the policy already adopted by the Government, the high import duty on palm and other vegetable oils could be lowered.

The recommendation was made that the Government, when concluding bilateral trade agreements, should make clear provision for the export of soaps to the contracting countries and explore ways by which the Trade Commissioners' organisations could best serve the export interests.

Mr. P. B. Kurup said that in 1948 the industry produced 180,000 tons, against the installed capacity of 225,000 tons. Indigenous consumption was found to be only 125,000 tons, leaving an exportable surplus of 55,000 tons.

Today, India was faced with the problems of mounting production, stock accumulation, and decreasing purchasing power.

Plans for Fine Chemicals

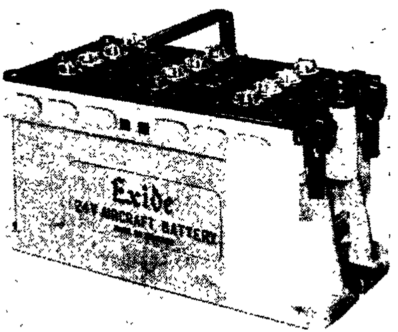
THE fine chemicals industry could be firmly established in India if its production was properly planned and its branches were developed under rigid control of production costs and of quality. That was the suggestion made by Mr. G. L. Mehta, president of the Tariff Board, in the course of his opening remarks during an inquiry in Bombay into a claim for protection or assistance of the fine chemicals industry.

The inquiry was mainly concerned with four chemicals; calcium lactate, iron-ammonium citrate, potassium citrate, and sodium citrate.

Production of these chemicals by the process of fermentation of molasses or citrus juice, of which there was abundant supply in the country, said Mr. Mehta, could form a nucleus for the production of various other organic compounds, such as butyl alcohol, acetone, acetic acid, ethyl acetate and other products.

Technical Publications

EFFECTIVE use of polythene to procure lightness with adequate strength in construction of storage batteries is seen in the new Exide battery designed by Chloride Batteries, Ltd., London. This 24 volt unit (type 12-ZCII) weighs only 43½ lb. complete with acid, and has a capacity of 25 amp.-hours. The container is a one piece 12 compartment monobloc moulding of polythene, which is unaffected by sulphuric acid, oil or petrol and will withstand extremes of low or high temperatures.



[Courtesy, Chloride Batteries, Ltd.

Representing a newer use of polythene for strength and lightness in battery construction

* * *

COLLECTION of grit and dust in light industries is in some respects a more complex problems than in boiler plants, in which higher costs are justified. A low resistance dust collector, easily fitted to small boiler plants with steel chimneys, is described by Prat-Daniel (Stanmore), Ltd., in its latest catalogue (No. P.21). The equipment is said not to entail heavy capital outlay to install and is simple to maintain.

* * *

"THE Acceleration of Particles to High Energies" is the title of the latest addition to the Physics in Industry series of publications issued by the Institute of Physics. The new work, with a foreword by Professor M. E. Oliphant and an editorial by H. R. Lang, the Institute's secretary, is based on a session arranged by the Electronics Group at the Institute of Physics Convention held in May last year.

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IN processes involving filtration, diffusion or the use of porous electrolytic diaphragms, the pore size and permeability of the porous medium are two of the critical factors. These properties, practical aspects and flow curves are studied in detail by Doulton & Co., Ltd., London, in its latest reprint catalogue of porous ceramic media and accessories (Section No. 10). This is one of a series covering the company's standard range of products in chemical and general stoneware, laboratory and technical porcelain, and ceramic insulating materials.

* * *

DESERVING to be preserved by chemical engineers because of the detailed information of physical and mechanical properties of K-Monel is the latest booklet published by Henry Wiggin & Co., Ltd., Birmingham. This precipitation-hardening nickel-copper alloy is stated to have the the corrosion-resistance of Monel and mechanical properties equal or superior to those of heat-treated alloy steels. Results are given, taken at normal and elevated temperatures, covering compression, shear, fatigue, tensile and impact strengths.

* * *

CENTRIFUGAL and other types of pumps, dust extraction plant, and furnaces are among the new and reconditioned plant described in "Plant" (Vol. 1, No. 4) now available from Chamberlain Industries, Ltd., Leyton, London.

Mobile Lighting Display

OPPORTUNITIES to study the effects of a great variety of forms of industrial lighting fitments without the necessity of visiting a showroom, possibly remote, are provided by a new mobile showroom introduced by Crompton Parkinson, Ltd.

By skilful planning, more than 30 different types of fittings can be displayed, while a variety of reflectors for industrial lighting, either by fluorescent or filament lamps, is available for inspection.

Different voltage supplies are provided for by a Variac transformer control which can be connected to any electricity supply from 200 to 250 a.c. volts to give an output of 230 volts.

INDUSTRIAL SAFETY GLOVES

New PVC and Rubber Standards

A NEW standard specification, for industrial safety gloves, which is shortly to be issued by the British Standards Institution, has been prepared under the supervision of the Personal Safety Equipment Standards Committee consisting of representatives from, among others, the British Chemical Plant Manufacturers' Association, the Association of British Chemical Manufacturers, and I.C.I., Ltd.

It is stipulated that PVC gloves, mittens and one-finger mittens shall consist of a uniformly compounded polyvinyl-chloride mix made from virgin materials, deposited on a suitably-shaped base fabric. Except on the cuff and at the seams, the gloves shall have a uniform thickness of not less than 1.5 mm. and not more than 1.8 mm. On the cuff the thickness shall not be less than 1.3 mm. A method of micrometer determination of the thickness is specified.

To ensure maximum abrasive resistance in so far as the rough type is concerned, and maximum impermeability to dangerous acids and chemicals where the smooth type is concerned, penetration of the resin into the base fabric during moulding shall be approximately 33⅓ per cent.

For air-pressure test, the polyvinylchloride glove is to be plugged at the wrist by means of a suitable plug fitted with an inlet tube to permit the entry of air under low pressure. The glove shall then be immersed in water with the fingers downwards, so that the water level corresponds to the position of the plug in the wrist and any adherent air bubbles removed by gentle brushing. Air under a gauge pressure of 20 lb./sq. in. shall be introduced into the glove, which shall be maintained in this condition for one minute. The surface of the glove shall then be examined for the presence of air bubbles.

The accelerated ageing test laid down for rubber gloves is that test specimens, prepared as described in B.S. 903 ("Methods of Test for Vulcanised Rubber") shall be freely suspended in a thermostatically controlled air oven. The specimens shall be kept in the oven for a period of 168 hours at a temperature of 70 ± 1° C., provision being made for a slow circulation of air though the oven during this period. After removal from the oven the specimens shall be kept at a temperature of 65-75° F. (18-24° C.) for a period of 24 hours. They are then subjected to the tensile tests also described in B.S. 903.

DEFINITION OF RAYON

Not a Generic Term

FOLLOWING discussions which have been taking place recently regarding the use of the term "rayon" and of the need for a generic term for man-made fibres, the Textile Institute has reviewed the position, and reports that, at a meeting of the textile section of the International Standards Organisation at Buxton in 1948, it became clear that the weight of world opinion was against the adoption of the word "rayon" as a generic term embracing all man-made fibres. The British delegates themselves were unable to present a united front and for this reason they abstained from voting on the question. The textile terms and definitions committee, at its meeting on January 19, recommended that the published definition should be withdrawn. This recommendation was approved. At a meeting on March 14, the following tentative definition of the term was approved: "*Rayon*, noun (or adjective),—regenerated fibre wholly or mainly of cellulose origin." This term includes viscose, cuprammonium, acetate, and other cellulose ester and ether fibres.

Mixed-Bed Water Treatment

PRODUCTION of small quantities of extremely high purity water is of increasing importance to chemical industries.

Eight years ago the Permutit Co., Ltd., London, introduced a new technique in water treatment employing mixed cation and anion exchange materials for producing high quality demineralised water in a single step.

Adapted to peacetime requirements, this method can produce water with an electrical resistance of over 10 million ohms per cu. cm.

The ion exchange materials employed in this mixed bed deionisation technique are Zeo-Karb 315 and the newly developed highly basic anion exchanger De-Acidite F.

When a mixed bed is used for treatment of water which has been previously distilled or demineralised by a normal technique, the effluent from it is of a quality previously unobtainable without multiple distillation and is suitable for use as conductivity water and in trace element work.

Deionisation takes place in neutral solution, so that acid-sensitive solutions can be treated.

• HOME •

Works Extending

Plans have been approved for the extension of the works of the Cornbrook Chemical Co., Ltd., at Newbridge Lane, Stockport, Cheshire.

Water Pollution in Scotland

Industrial effluent is alleged to be responsible for one quarter of the water pollution in the Border area in Scotland, according to statements at a conference held recently at Newton St. Boswells to decide on a policy for purification. Arrangements to improve domestic sewage are reported to be already in hand, and further action by industrial concerns is now thought to be essential.

Whale Oil Arrivals at Liverpool

First of the great whale factory fleet to reach Liverpool is the 19,000-ton Norwegian factory ship *Kosmos V*. She arrived with a full cargo of whale oil, of which 8350 tons was discharged into lighters which conveyed the oil to Bromborough. Whale oil is arriving in the Mersey in such great quantities that storage is becoming limited and, for the first time since Antarctic whale hunting reopened after the war, two ships have had to be diverted to London.

Textile Institute's Appeal

The rapid extension in the activities of the Textile Institute since the end of the war has placed a heavy strain on its financial resources. To enable it to maintain its work, the institute has issued an appeal for financial assistance to over 5000 textile firms throughout the country. In 1948 it incurred a deficit of £4318, and in 1949 a further deficit of £5206. It has already awarded seven £750 scholarships and one open £1000 scholarship to young craftsmen and students, as well as many smaller awards.

Annual Meeting of Textile Institute

The Textile Institute is to hold its 40th annual meeting at the Grand Hotel, Leicester, on May 10. Prior to the meeting, the Lord Mayor of Leicester will extend a civic welcome to members. The meeting will be followed by the Mather Lecture, to be given by Mr. F. Scholefield (head of the department of textile chemistry, College of Technology, Manchester) whose theme will be " Sir William Mather —his contribution to the Textile Industry." Members of the institute will tour several Leicester textile works during the morning.

Coal Production Lower

Output of coal last week was 3,135,400 tons (2,959,100 deep-mined; 176,300 open-cast) compared with 3,965,500 tons (3,722,400 deep-mined; 243,100 open-cast) the previous week, and 3,918,100 tons for the corresponding week of last year.

Another U.S. Industry for Scotland?

Ranco, Inc., of Cleveland, U.S.A., manufacturers of thermostats and electrical instruments, is reported to be considering the location of a British factory in one of the Scottish industrial estates. There are already 18 American and Canadian firms operating in Scotland.

Pollution of the Atmosphere

Complaints of smoke nuisance, alleged to have been caused by the penicillin factory, Speke, have been reported to the Whiston Rural District Council by the chief sanitary inspector. The committee resolved to contact the smoke inspector, Liverpool, to remedy the position.

BISOL Dibutyl Phthalate

British Industrial Solvents, Ltd., announces a reduction by ½d. per lb. in the price of dibutyl phthalate with effect from April 11. This applies to contract as well as spot purchases. Some revised prices are: 10 tons, 1s. 9¼d. lb.; 1-5 tons, 1s. 10d. lb.; less than one ton, 1s. 10¾d. lb.; deliveries in 10-gallon cans 2s. lb.

Few Science Graduates

The report of Oxford University Appointments Committee for 1949 draws attention to the fact that during last year only 15 men from Oxford took school appointments in mathematics, physics, and chemistry, and there were no biologists. Low salaries are being paid in the teaching profession, says the report, and graduates are naturally turning more to posts in commerce, industry and the Government scientific service.

Board of Trade Department's Move

The Administration of Enemy Property Department of the Board of Trade removed on April 17 to Lacon House, Theobalds Road, London, W.C.1. (Telephone, Chancery 4411). Among the other parts of the Board of Trade which will be moving into Lacon House over the next three months are the Nitrogen Directorate, Paper Control (Newsprint), Leather Control, Technical Information & Documents Unit and the Exhibitions branch.

· PERSONAL ·

THE Lord President of the Council has appointed **PROFESSOR SIR IAN HEILBRON**, D.S.O., F.R.S., to be chairman of the Advisory Council for Scientific and Industrial Research in the place of Sir Geoffrey Heyworth, who resigned owing to pressure of other public duties. Sir Ian Heilbron is now director of research of the Brewing Industry Research Foundation near Redhill, Surrey, and Emeritus Professor of London University.

DR. H. W. B. SKINNER, who succeeded Klaus Emil Julius Fuchs as head of the theoretical physics division at the Atomic Energy Research Establishment, Harwell, Berks., has left to occupy the Lyons Chair of Physics at Liverpool University.

DR. J. BRONOWSKI, assistant chief scientific adviser at the Ministry of Works, has been appointed director from May 22 of the National Coal Board central research establishment, Stoke Orchard, near Cheltenham. Dr. Bronowski, who is 42 and a mathematician, is known as a broadcaster on scientific subjects.

The council of the Textile Institute is nominating **MR. GEORGE SPENCER**, of Winwick Manor, West Haddon, near Rugby, as president of the Institute in succession to Mr. J. Foster Beaver, who has completed two years in office. The new president is chairman of several textile and dyeing and finishing companies.

PROFESSOR W. J. DILLING, professor of pharmacology in the University of Liverpool, has resigned, owing to ill-health, from the Council of the Pharmaceutical Society of Great Britain, on which he has served since 1938.

LORD LUCAS OF CHILWORTH, Parliamentary Secretary to the Ministry of Transport, will be the guest of honour at the annual dinner of the Traders' Road Transport Association, national organisation for "C" licence-operators, in London, on April 25, at which the president, **COL. A. JERRETT**, will preside.

MR. EDMUND SPYET, of Brantridge Forest, Balcombe, Sussex, formerly a director of Murex Welding Processes, Ltd., Clover Paint and Composition Co., Ltd., and Murex, Ltd., left £362,115, £357,269 net.

PROF. ALBERT PORTEVIN, to whom the Institute of Metals recently awarded its platinum medal (THE CHEMICAL AGE, 62, 516), is renowned for his contributions to the science of physical metallurgy, particularly of steels. The professor, it is recalled in a current note from the institute, has particularly studied the process of fusion and solidification and of transformations in the solid state. He extended Tammann's method of thermal analysis to ternary systems, and, with Prof. Chevenard, perfected methods of dilatometric analysis. With M. Castro, he carried out important studies of the non-metallic inclusions and of the determination of oxygen in steels, and developed micrographic methods for the study of non-ferrous alloys, comparable with those used for steels. His work on the transformation of steel and on the light alloys of aluminium has been extensive.

BA Chemistry Programme

THE British Association will hold its annual meeting this year in Birmingham, from August 30 to September 6. First programme details indicate the themes of the chemistry section (B) of which the proceedings will be opened by the section president, Professor E. L. Hirst, on August 31 with the paper "Modern Developments in Carbohydrate Chemistry." The subsequent discussions planned are these: September 1, "Chemistry of Plastics, Rubber and Fibres"; September 1, "Chemistry of the Cell, with special reference to the Nucleus"; (Sections B and K); September 4, "Chromatography"; September 5, "Harnessing Chemical Energy"; September 6, "Chemistry of Muscular Contraction" (Sections B and I).

OBITUARY

DR. FREDERICK THOMAS PEIRCE, an outstanding textile physicist, who was for 24 years engaged in research at the Shirley Institute of the British Cotton Industry Research Association, Didsbury, Manchester, has died in Sydney, Australia.

MR. JOSEPH SYKES, a director of Reads of Liverpool, has died in his eightieth year. He had 49 years' service with the group, having joined Reads, Ltd., in 1904 as factory manager at its Bridgwater Street (Liverpool) works.

OVERSEAS

Yugoslavia to make Duralumin

The Lozovao (Jugoslavia) Aluminium Works is reported to have completed preliminary work in connection with the manufacture of duralumin; output is expected to start on a regular basis fairly soon.

Rumanian Mining and Metallurgical Trust

The first mining and metallurgical trust has recently started operations in the Baia Mare district of Transylvania (Rumania). It integrates the Phoenix Chemical Works, the Ferentiu Chemical and Metallurgical Works, as well as all gold, siver, lead, zinc and copper mines located in the Baia Mare, Satu-Mare and Maranures districts.

Indian Penicillin and Sulpha Drugs

An agreement has been signed recently between the Government of India and the Swedish firm, Karnbolegat, Stockholm, for the manufacture of penicillin and sulpha drugs in India. The proposed factory in Bombay is estimated to cost Rs.3.5 crores and may be completed by the end of the financial year 1951-52.

Swiss Nylon

Viscose S.A., Emmenbrücke, Switzerland, a company which belongs to the French Rhodiaceta group, has decided to make a partial conversion of its manufacturing programme to the production of nylon is justified. The firm possesses a U.S. licence and the required machinery and equipment will be imported from the U.S.A.

French Petroleum Chemicals

The Société Naphachimie's petroleum chemicals plant, in course of construction near Etang de Berre, has a planned throughput of 52,000 metric tons of crude oil annually. It will produce a variety of chemical products, including glycols, solvents (21,000 tons of spirit having a high octane content) and 28,000 tons of 50° Bé washing soda.

Hebrew University's Anniversary

Messages of congratulation to the Hebrew University on its 25th anniversary were conveyed from Britain by Dr. F. A. Freeth, of I.C.I., Ltd. One message, in an embossed leather cover, was from the Royal Society and was signed by Sir Robert Robinson. The others were from Liverpool University and the Institution of Chemical Engineers. Dr. Freeth, who spent three weeks touring Israel, was the guest of the Hebrew University for four days.

Algae Industry for Morocco

A company has been formed in Morocco to treat the algae found near Safi. It is expected that 100 tons a day will be gathered by the company, which has equipped a factory for the extraction of iodine salts and other derivatives.

Poland to Make Lactose

The first Polish penicillin works, established at Tarchomlin, near Warsaw, which has so far relied on imported lactose, is constructing in Lower Silesia a large works which, when completed, is expected to supply a large part of the growing lactose requirements.

Calcutta's First Cyclotron

A cyclotron has been installed in the Nuclear Physics Institute, Calcutta University and Indian students have been sent abroad for training in handling the machine, announced Pandit Nehru, the Prime Minister, in the Indian Parliament, last week.

Chinese Chemical Industry

Expansion of China's chemical industry is to be confined this year to the North-Eastern part of the country. Current reports state that priority is to be given to the production of fertilisers, dyes and cement. Government investments are to be directed chiefly into fertiliser manufacture and centralisation is to be encouraged.

Dutch Penicillin Progress

Penicillin output by the Yeast and Spirit Co. (Nederlandsche Gist en Spiritusfabriek, Delft) is reported to be steadily increasing. Dutch use of the drug has been much encouraged by recent price reductions made by the company. At the end of 1949 a variant, "depocillin," was marketed, described as a form of penicillin which has a delaying effect.

Radioisotopes for Cancer Research

The cancer research centre, which will carry out experiments with perishable radioisotopes, was established this month near Oak Ridge, Tennessee. Children suffering from leukemia (cancer of the white blood cells) will be among the first to be admitted to the hospital. The research programme will be financed by public funds and directed by the Oak Ridge Institute of Nuclear Studies. Cancer research will also be conducted by the U.S. Atomic Energy Commission at the Argonne National Laboratory at Chicago, and the Brookhaven National Laboratory, Long Island.

Next Week's Events

MONDAY, APRIL 24

Society of Chemical Industry

London: Royal Institution, Albemarle Street, W.1, 6 p.m. Dr. L. H. Lampitt: "Towards International Collaboration in Science."

The Royal Institute of Chemistry

Gillingham: Medway Technical College, Gardiner Street, 7.30 p.m. Dr. N. Booth: "Careers for Chemists."

Oil and Colour Chemists' Association

Hull: Royal Station Hotel, 6.30 p.m. AGM, followed by film: "The Scientific Manufacture of Printing Ink."

TUESDAY, APRIL 25

The Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. M. M. Hallett: "Corrosion Resisting Cast Alloys Containing Nickel, Chromium and Molybdenum."

The British Ceramic Society

Stoke-on-Trent: Jubilee celebrations convention (and at Buxton). April 25-27. Papers, works visits, dinner, etc.

The Institute of Physics

Newcastle-upon-Tyne: King's College, 7 p.m. Dr. L. A. Sayce: "The Light Division of the National Physical Laboratory."

WEDNESDAY, APRIL 26

The Chemical Society

Portsmouth: Municipal College, 7 p.m. (with RIC and Portsmouth Chemical Society). Dr. W. A. Roach: "Trace Elements in Plant Life."

Society of Chemical Industry (Food Group)

London: Burlington House, Piccadilly, W.1, 6 p.m. Nutrition Panel AGM. 6.15 p.m. Dr. F. Wokes: "The Nutritional Significance of Vegetarianism."

Eastbourne: Pavilion, Winter Garden, Devonshire Park, 10 a.m. Joint meeting with Royal Sanitary Institute. Discussion: "Hygiene and Food Manufacture."

British Association of Chemists

Birmingham: University, Edmund Street, 6.30 p.m. G. E. Smith: "The Production of Essential Oils and their Uses in Industry."

Manchester Literary and Philosophical Society (Chemical Section)

Manchester: Portico Library, Mosley Street, 5.45 p.m. Dr. H. Gudgeon: "Some Aspects of Industrial Chemical Research."

The Institute of Fuel

London: Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. (open to public). E. Bonwitt and H. E. Charlton: "The Fuel, Heat and Power Aspects of the Petroleum Chemicals Plant for Petrochemicals, Ltd., Partington."

THURSDAY, APRIL 27

The Chemical Society

Sheffield: University, 5.30 p.m. Tilden Lecture. Prof. F. S. Spring: "Recent Advances in the Chemistry of the Steroids."

Incorporated Plant Engineers

Sheffield: Grand Hotel, 7.30 p.m. "Costing for the Plant Engineer."

Society of Chemical Industry (Agriculture Group)

London: Royal Institution, Albemarle Street, W.1, 6 p.m. Inaugural meeting of the Crop Protection Panel. Dr. H. Martin: "Advances in Chemical Methods of Crop Protection."

FRIDAY, APRIL 28

Royal Institute of Chemistry

Stockton-on-Tees: William Newton School, Norton, 7.30 p.m. AGM. Dr. H. J. T. Ellingham: "Recent Developments in the Work of the Institute."

The Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m. Dr. P. Coheur: "Direct Spectrochemical Analysis."

Development of Electronics

SOME idea of the wide field served by modern electronics and how this science is serving many industries was evidenced by the seventh private exhibition of the Radio and Electronic Component Manufacturers' Exhibition held at Grosvenor House, London, this week.

Mr. G. R. Strauss, speaking at the inaugural luncheon, said that the Ministry of Supply and the industries represented were virtually in partnership in development of the science of electronics.

Representatives from 20 countries attended the opening of the exhibition by Sir Robert Renwick. Besides valves, and test gear for the radio television, electronic and telecommunication industries, some of the components on view played an important part in nuclear research and atomic energy development.

A feature of the display was a tendency to make miniature components. Some of the valves developed for hearing-aids are so small that three will go into a thimble.

The Stock and Chemical Markets

NOW Budget uncertainties have been removed, the City is expecting some improvement in business in stock markets and a revival in new issue activity.

The expected big issue by British Electricity is likely to appear shortly and the terms of this may have an important bearing on the gilt-edged market. A big issue may also be pending from British Oxygen, whose annual report shows capital commitments of £3 million.

Chemical and kindred shares are moving within narrow limits, with Imperial Chemical slightly lower at 42s. 6d. Laporte Chemicals 5s. units are 9s. 3d., Boake Roberts 26s. 3d., Brotherton 19s. 3d., and Albright & Wilson have firmed up to 29s. in anticipation of the results. F. W. Berk 2s. 6d. shares were 14s. 3d. Triplex Glass shares rose sharply to 18s. 3d., and United Glass Bottle, at 69s. 4½d., remained firm on the financial results.

Monsanto Chemicals were firmer at 48s. 3d. on the full results and the chairman's annual statement, which emphasise the progressive policy of the company. British Glues & Chemicals 4s. shares remained more active in anticipation of good results, changing hands around 20s. 9d.

There was again uncertainty among shares of companies connected with plastics. De La Rue at 19s. 9d. failed to recover from their recent reaction, but British Xylonite have been firmer at 66s. 10½d. The 4s. units of the Distillers Co. were more active around 17s. 6d. United Molasses fluctuated at about 40s., but Dunlop Rubber eased to 61s.

British Oxygen were easier at 93s. 9d., awaiting the annual meeting for possible news of an issue of capital. Should it be made, the market expects shareholders to have preferential terms of allotment.

Iron and steel shares were generally firmer and Guest Keen strengthened to 41s. 3d. in anticipation of the financial results. Stewarts & Lloyds strengthened to 51s.

Cement shares remained under the influence of the view that prospects of higher profits for leading producers are promising. Associated Cement were 79s. 9d. and Tunnel Cement 47s.

Boots Drug remained active around 46s. 3d., the market view continuing that the dividend is likely to be maintained for the current year. Beechams deferred units were about 13s.

Borax Consolidated shares kept steady at 51s. 6d. Glaxo Laboratories changed hands actively around 47s. Despite market talk that the Dutch company may not be able to maintain its dividend, Lever & Unilever became steadier at 39s. 10½d. Lever N.V. at 40s. were virtually at the same level.

Market Reports

A STEADY demand characterises nearly all sections of the industrial chemicals market, and few quotations have revealed any important changes. Some substantial changes were, however, anticipated as a result of the substantial rise in the price of copper. The seasonal call for fertilisers and insecticides is fully sustained and a fairly substantial movement in ammonium sulphate is reported. The soda products generally are in good request and a fair replacement business has been booked. The potash chemicals continue in brisk demand. Quiet but steady trading conditions prevail in the coal tar products market, with prices unchanged at recent levels.

MANCHESTER.—Although a steady to firm undertone continues in most sections of the Manchester chemical market, there has been little actual change during the past week. The major industrial outlets for heavy chemicals in Lancashire and the West Riding of Yorkshire are steadily employed and this is reflected in the volume of deliveries and the amount of replacement buying going on. The potash, soda and ammonia compounds are in good request and current inquiry covers a wide range of other products. Many of the fertiliser materials are meeting with a brisk demand and a steady trade is passing in most of the light and heavy tar products.

GLASGOW.—Business in general in the Scottish heavy chemical market, has been extremely slow during this week, the slowing up of orders being due to a desire to await the Budget decisions.

Metal Price Changes

The price of electrolytic copper was raised last Wednesday by £9 a ton to £162 a ton, delivered to consumers' works. The Ministry of Supply buying price for rough copper in slabs of from two to three cwt. was raised by £6 to £126 a ton. Tin prices reacted sharply, closing prices of £590 10s. to £591 showing a net loss of about £5 10s. a ton.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Turkdean, Ltd., Northleach, manufacturers of chemicals and insecticides. (M., 22/4/50.) March 21, deb., to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *Nil. Nov. 25, 1949.

Satisfactions

P. Foicik Son & Co., Ltd., London, E., vitreous enamellers. (M.S., 22/4/50.) Satisfaction March 27, of debs. reg. Jan. 22, 1947, to the extent of £500.

H. Russell (Soaps & Disinfectants), Ltd., Liverpool. (MS., 22/4/50.) Satisfaction March 27, of mort. reg. Dec. 27, 1946, to the extent of £3000 (bldgs. 6A1, 6A3, 6A5 and North Air Raid Shelter with piece of land containing the same having been released from the charge).

Turkdean, Ltd., Northleach, manufacturers of chemicals and insecticides. (M.S. 22/4/50.) Satisfaction March 25, of deb. reg. Sept. 2, 1949.

Company News

Brush Electrical Engineering Co., Ltd.

Net profit of the group for the year was £653,878. The directors recommend allocation of £500,000 to the general reserve; preference dividend £30,250; ordinary dividend (10 per cent) £88,000; balance carried forward to 1950, £54,278.

Monsanto Chemicals, Ltd.

The consolidated accounts show that the income of the Monsanto organisation last year was £963,766 (£1,014,262 in 1948). The net profit, after tax, depreciation and other provision, was £296,384. After providing for the parent company's dividends, £487,992 is to be carried forward (£445,296).

New Registrations

Britt Detergent Co., Ltd.

Private company. (480,658). Capital £1500. To acquire the business of detergent manufacturers carried on by D. S. Morgan at 16 Morden Road, Wimbledon, S.W.19 and Leighton House, Potters Bar, Middx., as the British Detergent Co. Director: D. S. Morgan. Reg. office: Eldon St. House, Eldon Street, E.C.2.

Bursley Plastic Supplies, Ltd.

Private company. (480,789). Capital £10,000. Manufacturers of dies and tools for plastic and other manufacturers; manufacturers of chemical products, etc. Directors: A. R. Horsley and L. H. Rattenbury. Reg. office: 59 New Cavendish Street, W.1.

Derustit Services, Ltd.

Private company. (480,735). Capital £100. To enter into agreements with Derustit, Ltd., Derustit (Bedford), Ltd., Derustit (Midlands), Ltd., and Metal Laundries, Ltd., and others for the acquisition of the electro-chemical process known as "Derustit," and to act as agents for them in the arrangement of contracts with any department of H.M. Government or the boards or corporations controlling any industry which has been or may in the future be nationalised. Subscribers: W. E. Harper, T. H. G. Coleman, B. G. Smith. Reg. office: Paragon Works, Angel Street, Dudley, Worcs.

Fome Detergents, Ltd.

Private company. (480,594). Capital £1000. Directors: E. R. Fielding, R. Fielding and N. Richmond. Reg. office: 215 Regent Street, W.1.

Stamgo Manufacturing Co., Ltd.

Private company. (480,822). Capital £4000. Manufacturers and refiners and distributors of oil and oil products of all kinds; graphite and graphite products; oil and graphite blenders, etc. Directors: K. Bruggemeyer and H. Stamford. Reg. office: 8 Wood Street, Kingston-on-Thames.

Change of Name

The name of Rawlins & Sons (Ultramarine), Ltd., has been changed to Reckitt's (Colours), Ltd.

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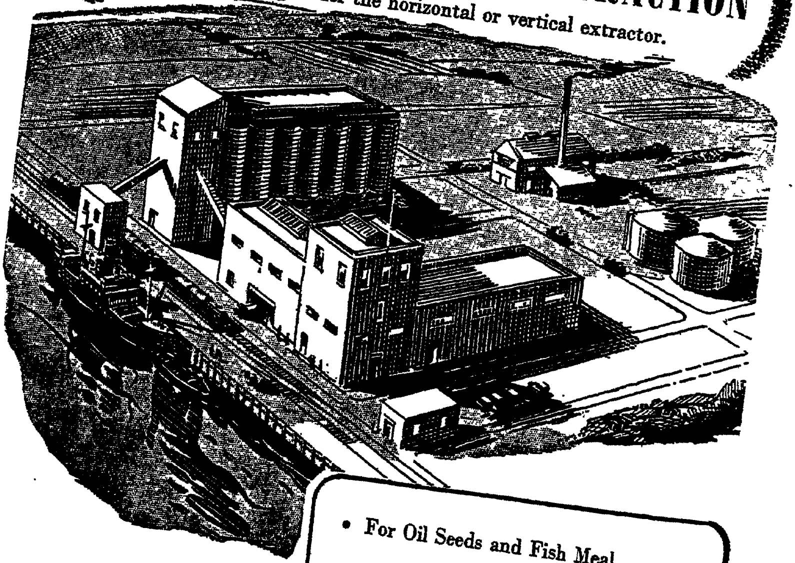

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted wil be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2 at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Separation of dl-threonine and dl-allothreonine.—Merck & Co., Inc. April 30 1947. 637,592.

Process for preparing a polyvinyl acetal resin and the polyvinyl acetal resin resulting from the said process.—Shawinigan Resins Corporation. May 9 1947. 637,737.

Preparation of organo silicon fluorides. —C. Shaw, W. E. Langrish-Smith, G. A. Page. May 21 1948. 637,739.

Preparation of oxidised rubber.—British Rubber Producers' Research Association, F. J. W. Popham, and J. L. Bolland. April 23 1948. 637,594.

Treatment of phosphatic substances, in particular for the manufacture of fertilisers.—Soc. Anon Des Manufactures Des Glaces et Produits Chimiques De St.-Gobain Chauny & Cirey. May 29 1947. 637,661.

Demethylation of methylbenzines.—California Research Corporation. May 29 1947. 637,595.

Process for the manufacture of aqueous dispersions of reaction products of high molecular weight from di-halogen hydrocarbons and polysulphides.—N.V. De Bataafsche Petroleum Maatschappij. July 4 1947. 637,528.

Metallo-sulpho-methyl-phenols.—Harvel Corporation. July 28 1947. 637,741.

Synthetic rubber-like compositions.—B. F. Goodrich Co. Oct. 30 1947. 637,600.

Hydration of lime.—N. V. S. Knibbs. Nov. 26 1948. 637,756.

Process for preparation of orthoformic esters.—General Aniline & Film Corporation. Dec. 5 1947. 637,757.

Continuous nitration apparatus.—Olin Industries, Inc. Dec. 9 1947. 637,561.

Bituminous paints.—H. G. Williams. April 29 1948. 637,758.

Process of preparing benzene hexachlorides. Solvay & Cie. Jan. 14 1948. 637,761.

Ferrous composition and their manufacture and application.—Hadfields, Ltd., E. W. Colbeck, and D. W. Adams. March 10 1949. 637,849.

Process for the manufacture of lead silicate.—Goodlass Wall & Lead Industries, Ltd., and N. J. Read. Feb. 8 1949. 637,622.

Case hardening of steel.—I.C.I. Ltd., and J. W. Britton. April 22 1949. 637,635.

Process for the catalytic production of carbon monoxide and hydrogen from hydrocarbons and steam.—N.V. De Bataafsche Petroleum Maatschappij. June 2 1948. 637,776.

Distilling process and apparatus.—J. L. Lavigne Et. April 4 1946. 638,348.

Preparation of substituted pteridines.—American Cyanamid Co. April 24 1946. 638,411.

Revivification of bone char.—I.C.I., Ltd., M. H. M. Arnold, and C. E. G. Simmons. July 1 1947. 638,492.

Hydrocarbon oil blends having viscosity-temperature characteristics.—C. Arnold. (Standard Oil Development Co.) Aug. 6 1946. 638,353.

Process for treating cellulosic raw material in order to obtain valuable products and by-products.—J. C. Seailles. Aug. 28 1946. 638,496.

Hydrocarbon lubricating or damping oil compositions.—C. Arnold. (Standard Oil Development Co.). Sept. 30 1946. 638,355.

Regenerated protein fibres and process for preparation thereof.—Manufacturers Research Laboratories, Inc. Oct. 7 1946. 638,356.

Halogen - containing compounds. — United States Rubber Co. Oct. 30 1946. 638,414.

Purification of N-[4-[(2-amino-4-hydroxy-6-pyrimido[4, 5-b] pyrazyl methyl]-amino-benzoyl]glutamic acid.—American Cyanamid Co. Nov. 5 1946. 638,415.

Treatment of porous thermo-setting resin products.—Dunlop Rubber Co., Ltd., and M. Gordon. Nov. 11 1947. 638,416.

Polycyclic diketopyrimidines.—General Aniline & Film Corporation. Dec. 2 1946. 638,504.

Production of oxygen by liquefaction and rectification of air.—Hydrocarbon Research, Inc. Dec. 3, 1946. 638,417.

Fractionation of tall oil.—Pittsburgh Plate Glass Co. Dec. 30 1946. 638,279.

Bituminous compositions.—N.V. De Bataafsche Petroleum Maatschappij. Jan. 22 1947. 638,507.

Substituted omega-aminoacetophenones and method of preparing same.—Sterling Drug. Inc. Feb. 26 1947. 638,510.

Recovery of sensible heat from gases.—I.C.I., Ltd., and G. Nonhebel. Feb. 27 1948. 638,511.

Diazotype light-sensitive layers containing 4-bromo resorcinol.—General Aniline & Film Corporation. March 10 1947. 638,419.

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Exploratory surveys are being made with a view to the extension of the network of mines in the Alsace region. The basin is approximately 125 miles long and consists of veins of sodium chloride, sylvite and schist. There are 106 mining allotments, 20 pits and six factories employing some 12,000 people.

Sales both at home and abroad are controlled exclusively by the Société Commerciale des Potasse d'Alsace.

Scientific Instruments in France

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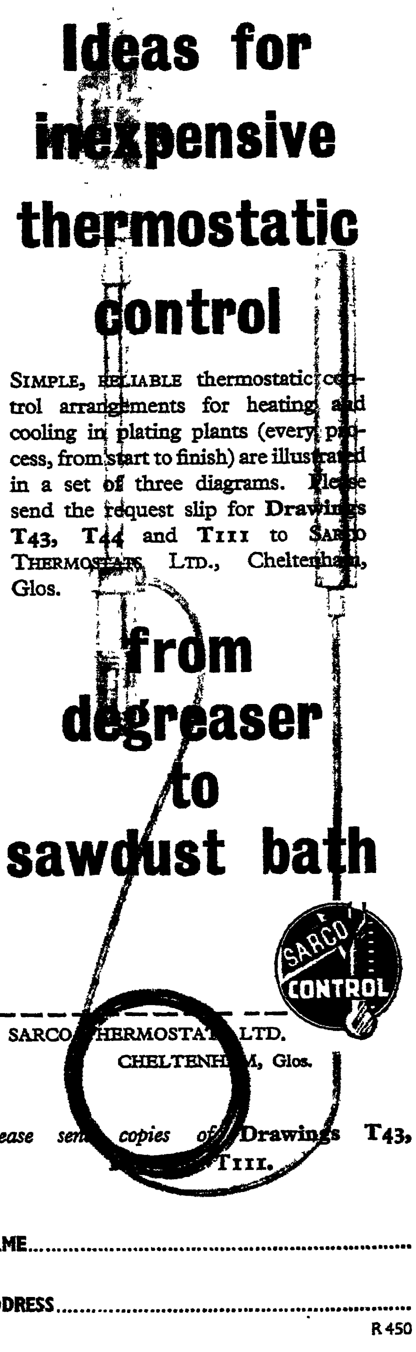

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THE Civil Service Commissioners invite applications for appointments as **SENIOR SCIENTIFIC OFFICER** and **SCIENTIFIC OFFICER**, to be filled by competitive interview during 1950. Interviews began in January and will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced. Successful candidates may be appointed immediately. The posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of fundamental and applied science. Candidates must have obtained a University Degree in a Scientific subject (including Engineering) or in Mathematics with First or Second-Class Honours, or an equivalent qualification, or possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' Post-Graduate or other approved experience. Candidates for Scientific Officer posts, taking their Degrees in 1950, may be admitted to compete before the result of their Degree examination is known.

Age Limits.—For Senior Scientific Officers, at least 26 and under 31 on 1st August, 1950 ; for Scientific Officers, at least 21 and under 28 (or under 31 for established Civil Servants of the Experimental Officer Class) on 1st August, 1950. **Salary Scales** for men in London Senior Scientific Officers, £700 by £25 to £900 ; Scientific Officers, £400 by £15 to £650. Rates for women are somewhat lower.

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A Vigorous Instruments Industry

THE scientific intsruments which Britain is making to-day represent what is probably the most promising sector of industrial output. It is not often that such a claim can be advanced with confidence in the unstable conditions of material supplies and changes in the balance of world trade and industry. In instrument production, however, British laboratories and workshops now hold a position, butressed by a host of intangible assets, which virtually ensures that whatever the future may hold, short of industrial stagnation, their contribution and rewards will consistently increase. The industries concerned are fortunate in being able to meet that promising phase better equipped with talent, experience and physical resources than almost any others.

Because the advancement of science has at all times depended upon the increasing improvement in the methods of measurement there has been an enduring and intimate community of interests between scientists of all kinds and those who made their instruments. Both branches have a common parentage derived from the pioneers in the sciences, who were accustomed to fabricate for themselves the instruments required to transmute their ideas into demonstrable form. The keynote to-day of the policy of the instrument makers is still the close collaboration with all the main fields of scientific research. Most of the work which now comes from the laboratories and drawing offices of the instrument makers thus shows an intimate understanding of the immediate needs of the research laboratories and of the larger demand which industries will make soon after. In that privileged position there is small danger that effort will be wasted in the production of goods for which the demand is waning.

Instrument making, in common with chemistry, has emerged from the war with a great accretion of strength, in spite of the fact that, like most chemistry departments, it had been obliged to concentrate all its forces into the channels dictated by defence needs. Whether it is true or not that the last conflict was in fact a " push button war," the fact that instruments were used on an unparalleled scale in every branch of the Services is beyond all doubt. Instruments and armaments were for a time virtually synonymous terms. Now that the unwelcome association has largely been ended by more creative objectives the very large expansion of productive capacity has

On Other Pages

Leader:
A Vigorous Instruments Industry . 595
Notes and Comments:
Upward Trend of Exports . . 597
Tracers and Industry . . 597
Assessing German Achievement . . 597
German Coal and Chemicals . . 598
Packaging . . 598
Concerting Industrial Policy . . 599
Increased Chemical Exports . . 600
Dissipating the Assets . . 601
The Light Oils Tax . . 601
Copper Buying . . 601
Electrochemistry in India . . 602
Laboratory Constructs its own Autoclave . . 602
SCIENTIFIC INSTRUMENTS REVIEW
New Trends in Instrumentation . . 603
New Aids to Microchemistry . . 605
Radioactive Isotopes in Industry . . 611
Organising the Instruments Department . . 615
Functional Design in the New Laboratories . . 617
Plastics in the Laboratory . . 619
Review of New Instrument Models . . 623
Standardising the pH Scale . . 636
New Designs in pH Measurement . . 637
Uniform Heating of Liquids to 350°C. . . 639
Control of Non-Luminous Flames . . 644
Chemists' Work in Aircraft Development . . 645
South Africa's Chrome Reserves . . 646
Production of W. German Chemicals . 647
The Mendola Medallist . . 650
Sir George Beilby Awards . . 650
Prices of British Chemical Products . 656

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left a legacy of which the industry is very well equipped to make full use. This is in effect "a second chance," for some such stimulus was given once before when the first world war established the importance of the scientific and technological departments. The scale of that impetus, however, does not bear comparison with the extraordinary advancement of science applications during 1939-45, and much of the advantage which was first conferred was dissipated during the period of industrial recession and uncertainty which characterised the 1920's.

The different situation to-day is founded in part on two exceptional factors, the fundamental changes brought about in the wartime development of electronics and atomic physics and the alacrity with which the faculties are being adapted for industries. Of these, electronic principles, had the great advantage of possessing an ample background of science and some technology before war enforced the rapid advance of the latter. Most of the veils of official secrecy were fairly quickly swept away when war ended. The resultant penetration of electronic principles into the laboratories and production centres has led to a concentration of effort which some regard as excessive. That conclusion was capable of being drawn from a superficial impression of the last exhibition of the Physical Society and some earlier corporate instrument displays.

The view, however, possibly overlooks a new factor affecting electronics and, to an increasing degree, the byproducts of nuclear fission—which are the subject of an authoritative review in this issue. Neither of these scientific tools belongs any longer exclusively to the research laboratories. The widening scope of instrumentation in industry is a development which the war greatly intensified. Electronic controls and the growing use of radioactive isotopes will not fail to require the production for industries of new categories of "utility" models of the laboratories' more versatile equipment. The substantial changes in production procedure must afford British instrument makers opportunities to serve a field larger than they have ever entered. That it need not be confined to these islands is suggested by the wholehearted participation by the Scientific Instrument Manufacturers' Association in the Canadian international trade fair in May.

Notes and Comments

Upward Trend of Exports

THOSE who look for omens on the eve of the BIF may find all they want in the official records of March export trade in chemical materials. For them the sharp revival of overseas sales represented by the overall figure of £8,274,000—£703,000 more than in February—may appear as conclusive evidence that the small setback in the export market in recent months has been overcome. That is most probably true, although there is no certainty that the beneficial effects will be shared by the BIF, which from the chemical manufacturer's point of view is much less important as an occasion for securing contracts than as a unique opportunity for meeting the representatives of counterpart and user industries. In either case the recording of substantial export increases in all the categories contributing to the enlarged total, of which industrial chemicals alone contributed over £4,518,000-£566,000 more than in February—will not fail to have effect as propaganda for British chemical materials. The result was helped considerably by the very much more ample trade being done with the South American countries and Scandinavia. These are opportune compensations for the great reduction of chemical trade with India, of which the first quarter's totals in 1949 and 1950 show a reduction of 75 per cent this year. The reduction or stoppage of some of these essential supplies is now being criticised by chemical processes industries for having severely limited industrial development in India.

Tracers and Industry

APPLICATION of radioactive tracer element technique in production and research in industry is still in its infancy. That confers a special interest on the facts that have been obtained by a questionnaire sent out earlier this year by a Surrey firm in an attempt to gauge the extent of interest if expert guidance were made available in the factories. Of 150 firms which replied to express their readiness to take advantage of this promising technique, the largest proportion—23—were engineers, followed by chemicals, which were integrated with metallurgical and food, each with 14. Textiles came next with 10, while among the remainder were: electrical engineering and paper 7 each; ceramics 6, rubber and plastics 6, with leather, paint and instruments 5 each. It was noted, however, that 18 firms had already opened or planned to open their own tracer laboratories. Excluding libraries, universities, journals and chambers of commerce, over 8000 sets of literature were sent out by Mactaggart & Evans, Ltd. These included 150 chemical consultants, 50 research associations, and 1350 chemical manufacturers in Denmark, Norway, Sweden and Holland. Replies from British firms (excluding research associations, consultants and Government departments) showed that 151 were interested, 505 were not.

Assessing German Achievement

THE final assessments of German technology during 1939-45, of which the latest review of paint industries (BOIS Survey 22) may be nearly the last to be published here, have usually moderated some popular beliefs about phenomenal achievement of applied science behind the German war fronts. No one will assail the reputation due to the great advances which some Germans made in chemical synthesis and such things as the Fischer-Tropsch and high-pressure acetylene sources. That creative and imaginative spirit was very far from being uniform. The paint industry survey is not the first to note that the use made in Germany of new or unconventional materials and processes was much below the quality of the research effort. It is put on record now that the German paint scientist and technologist seemed individually to be less curious and research-minded than his British counterpart. Raw materials were often used without knowledge of their composition. This survey, which most usefully collates the sectional reports which have already appeared, serves, however, to underline the very important advances in Germany providing new sources of urethane oils and polyurethane resins, synthetic resins and resinous materials.

German Coal and Chemicals

THE repeated appearance of accounts of rapid industrial recovery in the western zones of Germany leave no doubt at all of the existence of a determination to recapture the position in world commerce of which the bid to dominate the world deprived her. These industrial stories are evidently authentic, even if an element of propaganda colours the selection of material for publication outside Germany. They deserve to be studied closely by those who pontificate about economic and industrial possibilities in places where wartime destruction is no longer a serious impediment to full production. Allied technicians accompanying the armies in 1945 found the Aachen and Ruhr coalfields temporarily or permanently bereft of some 35 per cent of surface installations, chiefly as a result of bombing attack, and flooding and general disorganisation characterised the whole. In less than five years production has been raised from a trickle of some 30,000 metric tons of hard coal daily to about 360,000 tons, only 88,000 tons short of the record achieved when Germany was pressing on her plans for war. Some of the credit must go to the Allied commissions, whose confident prediction that they can secure the raising of 400,000 metric tons daily by November next might make a curious contrast with the more tentative policies of the National Coal Board—if such a comparison could fairly be drawn. Incentive schemes employed by the Coal Commission in North Germany, including 44 per cent wage increases, appear to have produced almost automatically the desired result. The temptation to draw parallels between an effort which was required to stave off national dissolution and the less obviously urgent tasks in post-war Britain has to be resisted. But as an earnest of the increasing industrial force with which industries will have to compete in the Western markets the recent records of the German coal and chemical industries leave room for no half measures here.

Packaging

INTELLIGENT packaging has become, since the war, one of the bigger preoccupations of chemical industries, from two standpoints. Besides forming an essential study for the dispatch departments, packaging accounts for an important new branch of chemical technology concerned with the provision of a number of surprisingly effective new materials. What is not generally realised is the debt which the present technology owes to wartime investigations by the Army. The Forces (principally the RAOC) started a small revolution in packaging technique, employing as "shock troops" a select band of experts assembled by Major-General Sir Leslie Williams, who last week recalled, in London, the initiation of that campaign. He was speaking to the Institute of Packaging, which has inherited and notably advanced what was started in the ordnance depots, and recalled how the inadequacy of the early Army packaging jobs was revealed by the receipt of smashed consignments in the theatres of war. That was the subject of one of the legitimate complaints by Stalin—to Mr. Churchill. Mr. John Evan Cook, the new chairman of the Institute of Packaging, was one of the experts which the Army called in to tour the country and preach the new doctrine of packaging war supplies. He pursues the same mission now, to a different audience. The mission's growing success is reflected in the intention of industry to rectify such matters is apparent from the institute's membership; it has increased by some 40 per cent during the term of office of Mr. G. M. Ashwell, packaging adviser to I.C.I., Ltd., the retiring president.

CONCERTING INDUSTRIAL POLICY

FBI President on Prospects for Producers

SOME of the more urgent problems confronting industries were surveyed by Sir Robert Sinclair, member of the Dollar Exports Board, in his address after his re-election as president of the Federation of British Industries, in London last week.

The virility of productive industry had been strikingly emphasised during the past year, said Sir Robert, not only by an appreciable increase in total production but also by considerable improvement in our position as regards dollar balances. There were good grounds for hopefulness.

"But," he continued, "let me say, with all the emphasis that I can command, that, unless there is a substantial reduction in Government expenditure soon (so as to make possible reductions not only in corporate taxation but in general taxation as well), we are not going to make the best of the recuperative power that is in us.

"Past or present achievements, whether of increased total production or of higher productivity, do not vitiate this argument. The incidence of taxation on industrial companies has had the result not only of forcing them to live on capital, but also of preventing the adequate provision for future needs on which our future performance must depend. The increase in initial allowances for replaced capital will help: but this is at best an anticipation of allowances that we should in any event receive. It is no substitute for the reduction in Government expenditure."

No More Nationalisation?

Other points from the president's address were these:—

We trust (he said) that one result of the recent General Election will be at least indefinite postponement of further proposals of nationalisation. And we profoundly hope that, in the interests of united national effort wiser counsels will prevail to prevent the nationalisation of iron and steel getting under weigh next October. The industry itself continues month by month to give truly remarkable proof of its virility and its enterprise under the existing conditions.

The hard facts of our present situation are exemplified in what our money will buy today. To replace our machinery costs us two and a half to three times what we paid for the old; and the cost of financing our raw material purchases has in general been heavily increased, the more so since sterling was devalued.

Meanwhile, taxation is eating into our savings, corporate and private. Industry is undoubtedly threatened with a depletion of capital which, unless corrected, must make expansion difficult and even prejudice the maintenance of current production.

Without the continual replenishment of our industrial capital we cannot maintain that efficiency which is essential if we are successfully to meet world competition.

Productive industry is the life blood of our economy. Are we to jeopardise our future for the sake of a temporary wellbeing which must collapse if the foundations on which it is built are undermined?

No one wants to see the social services cut. No one wants to see our standards of living reduced. But we must live within our means.

Essential Economies

As I see it, a substantial reduction in Government expenditure and some lightening of the load of taxation is urgently necessary if the drain on capital is to cease.

The problem presented by the dollar gap is formidable. Its solution must be sought through many channels, and it is clear that even if the trading prospects with Canada are, as I believe, distinctly promising, we cannot expect any quick increase in direct U.K.-U.S. trade sufficient in itself to pay for what we must have from U.S.A. Yet I have no doubt that we are going to increase our dollar sales.

The Canadians, and the present administration in the United States, are sympathetic and will give us all the help they can. But a supreme effort is needed from our manufacturers and merchants if we are to make the most of our opportunities. The Dollar Exports Board is proving it can give valuable help.

The FBI president urged that there were opportunities for even wider service by trade associations in concerted activities in trade regulation and export promotion. The meetings now being held in various parts of the country under the auspices of the Dollar Exports Board, assisted by the FBI, should, he thought, clarify the opportunities and help to pave the way for action.

INCREASED CHEMICAL EXPORTS

March Totals Again Over £8m.

EXPORTS of chemicals in the first quarter of this year reached a total of £23,081,824 compared with £22,520,067 for the first three months of 1949, the value of chemical manufactures (excluding drugs and dyestuffs) showing an increase of nearly £1 million.

Totals for March also showed a marked improvement, the value of exports being £8,274,390 compared with £6,851,945 in February and £7,571,228 in March, 1949.

Imports for the first three months of this year of chemicals, drugs, dyes, and colours were valued at £8,660,086 an increase of £1,810,184 over the totals for the first quarter of 1949.

EXPORTS

	March, 1950	March, 1949
	Gal.	Gal.
Cresylic acid	142,285	78,794
	Lb.	Lb.
Salicylic acid and salicylates ...	124,319	186,440
Value of all other sorts of acid ...	£191,719	£105,681
	Tons	Tons
Sulphate of alumina	2,525	2,975
All other sorts of aluminium compounds	2,312	2,398
Ammonium sulphate	14,150	9,123
Ammonium nitrate	4,051	7,632
All other sorts of ammonium compounds	1,955	1,274
	Cwt.	Cwt.
Bleaching powder	14,984	41,219
All other bleaching materials ...	11,706	9,648
Collodion cotton	2,691	1,831
	Tons	Tons
Copper sulphate	7,831	3,341
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	36,936	49,157
	Tons	Tons
Fertilisers	3,491	2,143
Value of gases (compressed, liquefied or solid)	£27,211	£19,042
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	9,134	7,292
	Gal.	Gal.
Tetra-ethyl lead	95,473	120,348
	Tons	Tons
Magnesium compounds	860	629
	Cwt.	Cwt.
Nickel salts	6,473	4,515
Potassium compounds	6,446	6,000
	Tons	Tons
Salt	15,472	17,781
	Cwt.	Cwt.
Sodium carbonate	336,214	383,905
Caustic soda	232,067	126,383
Sodium silicate	24,466	33,931
Sodium sulphate	3,477	16,430
All other sodium compounds ...	86,900	79,191
	Gal.	Gal.
Tar oil, creosote oil, anthracene oil, etc.	3,952,799	4,103,741
	Tons	Tons
Zinc oxide	1,250	1,337
Total value of chemical manufactures (excluding drugs and dyestuffs)	£4,518,701	£3,952,331
	Lb.	Lb.
Acetyl-salicylic acid	154,904	141,031
	100 International Units	100 International Units
Insulin	1,144,148	752,611
	Mega Units	Mega Units
Penicillin	870,405	449,625
Total value of drugs, medicines and preparations	£1,726,491	£1,678,753
Total value of dyes and dyestuffs ...	£963,533	£807,531
Total value of paints, pigments, colours, etc.	£1,065,665	£1,132,613
	Cwt.	Cwt.
Plastic materials	53,400	34,477
Value	£709,730	£425,048
	Cwt.	Cwt.
Chemical glassware	1,421	1,238
Value	£55,151	£46,366
	Cwt.	Cwt.
Fans	3,964	4,978
Value	£115,167	£149,137
	Cwt.	Cwt.
Furnace plant	7,224	7,175
Value	£74,082	£95.236
	Cwt.	Cwt.
Gas and chemical machinery ...	26,989	26,299
Value	£358,101	£323,923
Optical instruments, value ...	£71,203	£91,698
Thermometers, mercury in glass instruments, etc., value ...	£42,713	£35.010

IMPORTS

	March 1950	March 1949
	Cwt.	Cwt.
Acetic anhydride	12,554	3,473
Acetic acid	—	—
Boric acid	12,500	8,300
Carbolic acid	1,968	—
Value of all other sorts of acid ...	£53,432	£59.797
	Cwt.	Cwt.
Borax	28,001	30.041
Calcium carbide	100	2,188
Cobalt oxides	357	448
	Tons	Tons
Fertilisers	30,049	35,894
	Lb.	Lb.
Glycol ethers and glycol ether esters	685,495	673,907
Iodine	132,256	132,126
	Cwt.	Cwt.
Potassium chloride	601,110	401,441
Potassium sulphate	21,940	55,364
All other potassium compounds ...	17,591	4,003
Sodium nitrate	—	181,342
All other sodium compounds ...	9,481	2,770
Carbon blacks (from natural gas)	69,345	39,848
Value of carbon blacks	£295,199	£130,771
Total value of chemicals, drugs, dyes and colours	£3,418,085	£2,467,393
	Tons	Tons
Sulphur	38,650	34,845
Value	£371,496	£286,729
	Cwt.	Cwt.
Gas and chemical machinery ...	6,697	185
Value	£159,957	£8,919

LIGHT OILS TAX

FBI Support for Opposition

A LETTER, supporting the protests of a number of industries that make use in their processes of light hydrocarbon oils, has been addressed by the Federation of British Industries to the Chancellor of the Exchequer. It observes that the additional 9d. applies for the first time to indigenous oils and represents a very large increase in the rate of duty on imported oils. There would therefore be both a wider field of manufacturers affected and a much higher rate of duty on those who have used imported oils. It was hoped the Chancellor would reconsider the decision. The letter recalls the concession promised in respect of agricultural vehicles or machines using taxed fuel. The federation considered that the industries using these oils in their processes of manufacture had at least an equal claim for relief in view of the necessity to keep down costs.

Higher Transport Costs

A further letter, stressing the serious effects of increased transport costs has been sent to the Chancellor on behalf of the FBI, the Association of British Chambers of Commerce, and the National Union of Manufacturers. It says, in part, " Our respective organisations desire to lay before you the very strong objection which they take to the proposals in your Budget affecting road transport. These proposals inevitably increase costs at a time when the necessity to curb all inflationary pressures is paramount, a point which you yourself have lost no opportunity of stressing."

Copper Buying

THE Minister of Supply was asked in the House of Commons by Mr. John Grimston why he had increased the price of copper by £9 per ton when the price he had to pay was only increased by £8 per ton. It was also asked whether, as this involved a further increase in cost for export industry wholly due to the policy of bulk buying, the Minister would re-examine the possibility of returning the buying of copper to private hands. To the latter part of the question Mr. J. Freeman replied that the matter would be re-examined if it could be shown how the return of copper buying to private hands could be effected without the loss of sterling copper to the U.K. manufacturing industries.

DISSIPATING THE ASSETS

Sir Ernest Benn on Current Policy

A WARNING that there was nothing very pleasant about what he was going to say—he was going to talk about the Budget—was given by Sir Ernest Benn, speaking at the 94th Individualist luncheon in London last week. This was Sir Ernest's first public engagement, marking his recovery from a recent illness, and he spoke of his delight in getting back to his accustomed activities.

Inconsistent

In the course of a forthright attack on the economic and industrial conditions created by the Budget proposals and previous Government policy Sir Ernest deplored the vitiation of moral and physical stamina in the nation by Sir Stafford Cripps' apparent design to create " a nation of Christian paupers." Sir Stafford Cripps's inconsistencies were calculated, Sir Ernest implied, to destroy any confidence in his policy. Having contraverted all his earlier assurances that the £ would not be devalued, the Chancellor had said, after the £ had been devalued, he would not tolerate any businessmen taking advantage of the situation. Now he had warned that we had not yet experienced the full effect of the rise in prices which must follow devaluation. Yet he saw no reason why the higher price of petrol should affect the cost of transport. Meanwhile, British Railways were losing half a million pounds a week.

Because of penal death duties, the country was littered with costly capital assets. Such property represented a national capital loss on an appalling scale.

All the legislation of the last year had been designed quite bare-facedly to carry on the good work of creating a new social system and destroying capitalism. " Is it not reasonable to suggest," asked Sir Ernest, " that if, in due course, we do get a new Government, they should, on the advent of national collapse, call Parliament together and put through a few Acts wiping out some of these things which have happened in the last five years?"

These five years had been spent in trying to get over four popular slogans—full employment, security, fair shares, and equality of sacrifice. Full employment, in plain English meant unrequited wages, and in many cases double money for half work, and in the case of the building industry treble money and no questions asked about the amount of work done.

ELECTROCHEMISTRY IN INDIA

Important Pioneer Work in Prospect

THE great potential value of electrochemical processes to industry and the achievements in that field of the U.S.A. were reviewed at the recent opening in Bangalore of an India section of the Electrochemical Society of America. It was the first occasion in the society's 50 years of existence that a foreign section had been founded outside the United States.

Dr. B. K. Ram Prasad, electrical engineer to the Government of Bombay, who was elected the first president of the society, referred to the pioneering work in Mysore, where the alkali, ferroalloy and other industries were established about 25 years ago.

Cheap Electric Power

Electrochemical processes, said Dr. Ram Prasad, could be of considerable help in finding substitutes for the coal and vital metals, such as copper and nickel, which India lacked.

The Government of India was planning to start river valley schemes which would give cheap electric power to industries. A definite quota of power for electrochemical industries should be allocated, he said.

Nearly 10 years ago an electrochemical industries panel had been set up by the Government and this was followed by the decision to establish the Electrochemical Research Institute at Karaikudi, South India. The building was expected soon to be in operation.

The president stated in conclusion that the India section would have an important rôle in advising industries, fostering research and furthering education in electrochemistry.

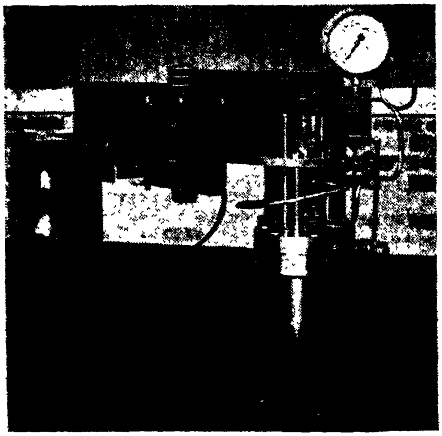
Dr. Gilbert J. Fowler, secretary of the Indian Section of the Royal Institute of Chemistry, wished success to the venture.

A Stable Savings System

MR. JOHN BENN, presiding on April 19 over the annual meeting of the United Kingdom Provident Institution for the first time since his election as chairman, said that insurance, in common with several industries, had been impelled to find its voice by the threat of nationalisation. The institution played its part in the Life Offices' campaign to defeat this reckless proposal.

The nation had learned that its life assurance savings now amounted to at least £2,000 million, an average of some £40 per head of the population. Moreover, as these savings were being maintained and increased at a time when most other forms of thrift had halted or gone back, the Chancellor of the Exchequer would do well to improve the amount of tax relief on life assurance premiums.

Laboratory Constructs Its Own Autoclave



[Courtesy of *The Autoclave*

This stainless steel high pressure autoclave was constructed in the Nickell laboratories of Monsanto Chemicals, Ltd., to supply an urgent need at short notice. A solid 10 *in. cube of stainless steel, weighing approximately* 2½ *cwt. was employed for the body and a corresponding billet* 3 *in. thick for the cover. Work was begun in July,* 1949, *and completed in February,* 1950, *seven months later. The only items purchased are stated to have been the pressure gauges, electrical components and control valves. Dimensions of the finished autoclave were: external diameter of body* 5½ *in.; internal diameter of body* 4 *in.; diameter of cover* 8¾ *in.; overall height (excluding fittings):* 10 *in.*

NEW TRENDS IN INSTRUMENTATION

Some Objects of Current Research

THE rapid progress made since the war in the development of new instruments and techniques for the chemical laboratory is seldom fully realised. Comments made recently that there has lately been a comparative dearth of inventiveness do not pay much regard to the changes, often of a fundamental character, which the availability of new instruments has brought about in the more laborious laboratory methods practised before the war. Modern equipment and methods are not only time savers, they almost invariably permit considerably more accurate results and are opening new possibilities for chemical research.

The past decade has witnessed big changes in the equipment of chemical laboratories. Only a limited number of *p*H recorders, for example, were in existence before the war. To-day, these instruments are recognised as standard equipment in practically all chemical laboratories. Yet there is still scope for further development in this field, for the production of an electric *p*H meter suitable for the full range usually required in chemical analysis presents technical difficulties which have not yet been fully overcome.

Alkaline Resistance

One of the problems here, connected with the design of glass electrode *p*H meters, is the production of an electrode which will satisfy the requirements of electrical conductance and also resist the high alkalinities to which it may be exposed. Changes in the glass have hitherto prevented the production of accurate readings after long periods of use. There appears to be as yet no instrument of this type which will operate in highly alkaline conditions for long periods without requiring the electrodes to be changed.

Much work has been done in recent years on the use of the infra red spectrum. This technique is particularly valuable for analysing fairly large organic molecules where the characteristic spectra have strong lines outside the ordinary visible range, so that they cannot be investigated by ordinary spectroscopy. Considerable attention has been devoted both at Oxford and Cambridge and also by the Ministry of Supply to the development of this technique and industry has produced infra-red spectrometers capable of quantitative analysis of organic mixtures by automatic operation.

This problem is closely associated with the development of improved detectors. They are of various types. They may be thermocouples, bolometers, or semi-conducting materials known as selective detectors because they respond only to a limited range of wave-lengths. The suitability of these various types is determined by the particular application for which the detector is required. A great deal of work has been done by industries, universities and Government laboratories in improving detectors and since the war rapid advances have been made.

Thermocouple Problems

One of the major difficulties has been to get a quick response with a thermocouple. The output from a thermocouple is very small and therefore requires to be amplified. To produce a d.c. amplifier which is both sensitive and trouble-free is extremely difficult. The alternative is to interrupt radiation by means of a rotating vane, thus causing a pulsating beam to fall on the detector and so produce a pulsating output, which can be amplified by the extremely sensitive and relatively trouble-free a.c. amplifier. Difficulties are presented, however, by the fact that to get a satisfactory a.c. amplifier the interruption frequency must be relatively high, whereas to get a measurable response from the thermocouple it must be low.

This problem has not been solved but progress has been made in two directions. Government laboratories have succeeded in producing a satisfactory amplifier which is sufficiently sensitive and operates at very low frequencies. Hence the thermocouple can be used with low interrupter rates.

Industry's solution to the same problem has been the production of thermocouples so small and so delicate that their thermal capacities are very low. Thus they respond much more freely and can be used with higher frequencies.

Important advances in the use of infra-red spectrometry have also been made in the growing of crystals. Glass is unsuitable since it absorbs infra-red radiations. The usual crystal transmitters are quartz, rock salt, potassium bromide or potassium iodide. Recently a substance known as "K.R.S.5" has been developed, which is particularly useful as a window material, because it transmits in wave length regions where most other substances absorb.

Of great interest to chemists is the general purpose mass spectrometer of the kind displayed by Metropolitan-Vickers at the Physical Society Exhibition. It is intended for measurements of ions having m/e ratios between 1 and 250. Without modifying the instrument, any of the more common types of problem encountered in mass spectroscopy can be investigated, such as isotope assays, studies of ionisation and dissociation, analysis of hydrocarbon mixtures, etc. Less common problems, such as gas reactions and the formation of intermediate products of combustion, can be studied with a minium of instrument change.

Measurements of abundance to an accuracy of ± 0.5 per cent are already obtainable for all isotopes present to the extent of 1 per cent, or more of the most abundant isotopes. Any single peak or any desired portion of the spectrum can be recorded on a 10-in. chart.

The Quantometer

Interesting possibilities are also presented by the quantometer, an instrument which has been developed in the U.S.A. and is reported to be the most rapid method yet devised for the analysis of metallic substances or chemicals. Whereas a qualitative breakdown is usually obtained by means of the spectrum of a particular mixture, the quantometer makes it possible for the constituents to be estimated quantitatively. Thus the time taken may be reduced from a matter of days to as many hours.

This system is based in effect on diffraction characteristics. A complete electronic unit, it requires a team of physicists, electronic engineers as well as a chemist to prepare the substance for analysis.

For any laboratory where continual analysis of a few products is required, the quantometer should be ideal. It may fill a great need in the production of non-ferrous alloys. No quantometer has, so far as is known, yet been employed in this country.

Another example of a new instrument likely to be of major importance is the automatic constant volume fraction collector, which was developed by the Chemical Research Laboratory, DSIR.

This apparatus is designed to collect separate fractions of eluent of constant but predetermined volume. The action is based on the interference of a beam of light falling on a photo-electric cell by the rising meniscus of the liquid being collected. The interruption of the beam operates a mechanism so that the vessel, filled to a predetermined level, is replaced by an empty one. The particular advantage of this apparatus is that constant volumes of liquid can be collected independently of variations in rate of flow, drop size of eluent, or specific gravity of the liquid. In addition, each fraction is collected without coming into contact with any portion of the preceding fraction.

Ultrasonic methods, not very extensively used, seem to present attractive possibilities for future development. There has been an increasing realisation during the past two or three years of potentialities. It is interesting to note that a general purpose ultrasonic generator is being placed on the market.

One attraction in the chemical field is the possibility of emulsification by ultrasonic radiations. This technique is being developed and has proved successful with mixtures which normally will not emulsify or which quickly separate out again.

Ultrasonics is also serving to initiate crystallisation in supersaturated solutions and to initiate certain reactions under conditions where they do not normally occur. It is possible that the same principle might also be the means of accelerating reaction rates.

Considerable attention is being devoted at present to the possibility of using pulverised fuels. To make the best use of this type of fuel it is necessary to ensure that each particle has the maximum surface exposed to the oxygen in the furnace atmosphere. That is secured if the particles are kept in motion. It has been suggested that by applying strong ultrasonic vibration the fuel particles might be kept in motion without the need for strong air current.

Ultrasonic Frequencies

The speed and readiness with which ultrasonic frequencies are transmitted by different substances depends to some extent on their molecular structure. Hence measurement of the velocity of transmission within a substance provides a means of distinguishing between materials. This can be done by passing a ultrasonic beam down a tube containing the specimen under examination, and using standard cathode ray tube technique to measure the time of transmission through the specimen.

Ultrasonics can be used for the polymerisation of various substances such as acetic acid and also to break down polymers into small molecules.

(*continued on page* 609)

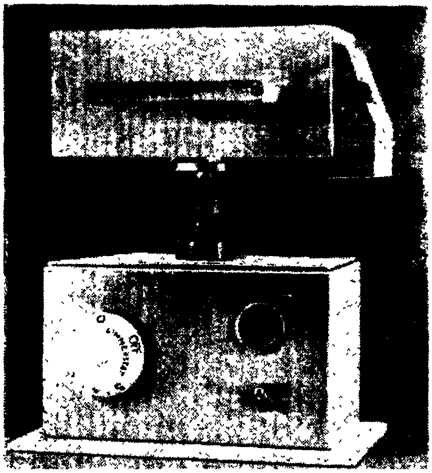
New Aids to Microchemistry

Semi-Automatic and Time Saving Devices

by Dr. JOHN T. STOCK, Ph.D., M.C., A.R.I.C.

MOST of the standard laboratory apparatus has been developed from prototypes improvised by enterprising workers to serve particular purposes. That the spirit of innovation and the capacity to introduce useful refinements of familiar laboratory apparatus is as active as ever was evidenced at the recent exhibition of new microchemical apparatus in the department of chemistry and biology of the Sir John Cass College, London, E.C.3.[*] The keynote of this was the abundance of well designed and effective instrument modifications, of which a large proportion deserve the attention of makers of standard equipment.

Mr. G. Ingram exhibited three beautifully constructed pieces of apparatus. The split-type micro-combustion furnace[1], for the determination of nitrogen, halogens, or sulphur (Fig. 1), exemplified simplicity of construction from readily available materials. The heater block is cut from a commercial refractory insulating brick, channels being drilled and filed to accommodate the combustion tube and the four alumina tubes containing the nichrome heating coils. In this manner, replacement of a burnt-out heating element is greatly facilitated. A simmerstat is provided for the control of the operating temperature.



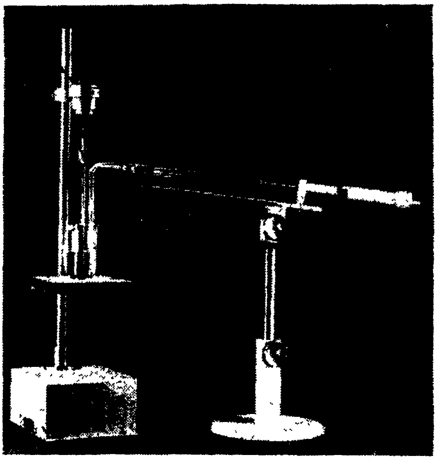


Fig. 1 (below). Split-type furnace with replaceable heaters. Fig. 2 (above). Micro-stirrer and syringe micro-burette

In a neat horizontal-type micro syringe burette of 1-ml. capacity (Fig. 2) the ejection of the reagent is accomplished by rotating the thimble of a specially-constructed micrometer screw head, which gives a delivery of 0.0005 ml. per division.

The power for the miniature electric driving motor of the micro-stirrer outfit (also shown in Fig. 2) is supplied by a small battery housed in the base of the unit. Although the motor runs very well on 1.5 volts, a higher figure is required for starting. This is provided by a booster starter button which on being released restores the voltage to that suitable for running. Rack-and-pinion adjustment is provided for the height of the titration platform, which is constructed from white plastic. A chuck on the motor shaft permits the stirrer head to be changed.

Heating blocks for micro-electrolytic apparatus were described and exhibited by Dr. A. J. Lindsey. Although the water bath used in the original Lindsey-Sand apparatus[2] provides a simple method

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[*] Organised by the author at the invitation of the Microchemistry Group of the Society of Public Analysts and other analytical chemists, and held in the college by courtesy of the principal, Dr. A. M. Ward, and the head of the department, Dr. A. J. Lindsey. Short papers on the new apparatus were submitted by the originators.

of heating the electrolysis cell, the manipulation when terminating an electrolysis is a little difficult. To overcome this, aluminium alloy heating blocks were designed to replace the water bath. These are divided vertically so that the hot segments may be lifted away and replaced by interchangeable cool ones without interfering with the alignment of the cell. The prototypes are being developed into patterns suitable for gas and for electrical heating respectively.

Simplifying Pressure Regulators

A one-piece pressure regulator and flowmeter, simpler and easier to use than the Pregl regulator and bubble-counter, was described and exhibited by Dr. W. T. Chambers. The desired pressure is maintained constant simply by allowing the gas to escape from the leg of a T-piece into an adjustable head of water. When, as in certain carbon-hydrogen combustion trains, different gases are metered alternately, the one regulator suffices. Coloured paraffin oil is the indicator liquid in the Friedrich-pattern flowmeter. The scale, being clipped to the limb of the U-tube, is readily adjustable to zero and, by turning through 180°, enables the apparatus to be used either right to left or *vice versa*.

Dr. Chambers also showed a micro-combustion tube for halogens and sulphur[3]. This is of quartz and operates at 800°-900°. It contains a sintered disc and quartz wool only and is made in one piece with a modified Hallett absorption tube. Samples of from 5 to 10 mg. are readily combusted in 20 min. and the combustion products may be washed out for a titrimetric finish. If only one of the elements S, Cl, Br, I is present, a single determination may thus be completed in 30 min. The combination of flowmeter and combustion tube with sintered disc greatly facilitates the combustion of volatile substances.

The routine quantitative ultimate analysis of organic compounds may be rendered in part automatic. Greater freedom is thus afforded to the analyst, and the essentially constant combustion conditions render the analyses more uniform. Further, with such an apparatus, an inexperienced operator can obtain results better than he can get from a manual apparatus.

With these factors in mind, Mr. F. J. McMurray designed the extremely workmanlike electrically-heated semi-automatic micro-combustion furnace (Fig. 3). It is for the determination of nitrogen, halogens, or sulphur. To facilitate rapid cooling of the combustion tube at the completion of the determination, the heater units are tilted backwards as shown; when the combustion is actually in progress the units enclose the combustion tubes and the front covers are lowered.

The shorter heater unit providing for the vaporisation of the sample is advanced along rails at a slow controllable rate by means of a spring-loaded half nut engaging a lead screw. A geared motor drives the screw by a small roller chain. Since the refractory cement blocks in which the heater windings are imbedded have large heat capacities, temperature variation is small. Describing an actual test carried out with the apparatus, the designer mentioned that 13 correct results were obtained in an 8½-hour day.

The sensitivity of optical techniques renders them of great value when concentrations are low or the size of sample is small[4]. This, in addition to the simple but ingenious design of the apparatus, probably accounted for the lively discus-

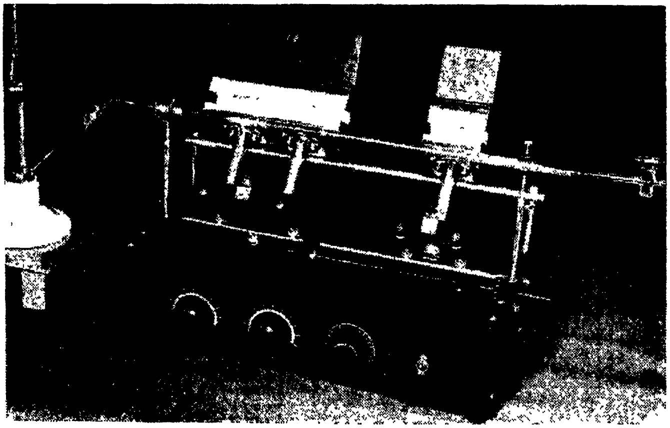


Fig. 3. Successful application of the time-saving principle illustrated by a semi-automatic micro-combustion furnace for the determination of nitrogen, halogens or sulphur

sion arising from the description of a photoelectric micro nephelometer[5] given by Mr. A. C. Mason.

In the usual type of nephelometer, the intensity of the scattered light does not increase linearly with the concentration, but tends to a limit beyond which a further increase in concentration has little effect. This is because the light scattered by the lower layers of the suspension is prevented from reaching the observer by the turbidity of the upper layers. By suitable design, which also permits the examination of as little as 0.1 ml. of a sample, this defect may be minimised. Increased sensitivity, a greatly extended concentration range, and applicability to coloured solutions are thus obtainable.

The nephelometer cell A, shown diagrammatically in Fig. 4, is constructed from an ordinary one-inch diameter boiling tube. Except for a narrow side window for the admission of light and a bottom window through which the scattered light emerges, the exterior is silvered. The sample is placed in tube B and is illuminated by a microscope lamp. Light scattering is measured by the current produced by photoelectric cell C.

Even when the central tube contains water, considerable light scattering occurs and a high zero reading is obtained. To compensate for this, the circuit arrangement (Fig. 5) is used. With water in the central tube, potentiometer P is adjusted until the galvanometer deflection is zero. Without altering the potentiometer setting, the turbid solutions are then examined. With bacterial suspensions, the relationship and concentration are practically linear.

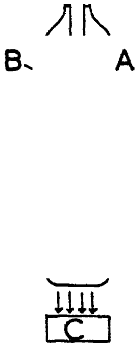


Fig. 4

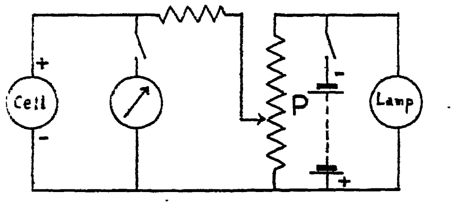
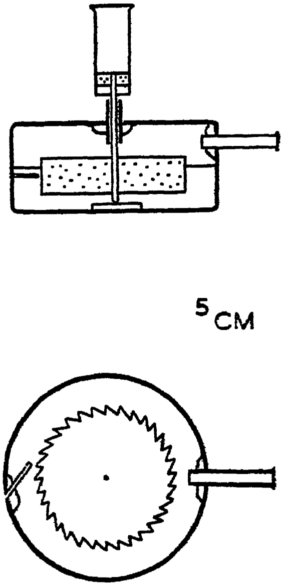


Fig. 5

Various vacuum-operated stirring devices[6] were described and demonstrated by Mr. M. A. Fill. In the version shown in Fig. 6, stirring is achieved by rotating the titration vessel. The body consists of two large Bakelite caps from screw-top reagent bottles, which are joined mouth-to-mouth by a band of adhesive tape. A disc of cork having some 32 teeth cut in the periphery forms the rotor 6A. The spindle is a portion of a darning needle running snugly in a glass bearing mounted in the upper cap. Since the point of the needle presses on a scrap of microscope slide waxed to the lower half of the body, running is almost frictionless.

When filter-pump suction is applied to the side tube, the blast of air entering through jet A impinges upon the rotor and causes the latter to turn. The upper end of the spindle carries a short length of glass tubing into which is slipped the tube containing the sample to be titrated. Agitation results from the encounter of the rotating solution with the stationary burette tip. With slight modification, the motor may be operated in an inverted position, so that it can be used for the more usual method of stirring.



Figs. 6 *and* 6*A*. *The vacuum-operated stirrer and its cork disc rotor*

When a solution in a closed system has to be agitated, or when, as in micro-electrometric titration, the presence of electrode system and burette tip leaves little room for the entry of the normal type of stirrer, the magnetic bar method is particularly valuable. A micro-stirrer operating on this principle is shown in Fig. 7.

Mounted on the spindle of a vacuum motor is a light, powerful magnet B in the form of a slotted cylinder. Platform C is a smaller bottle cap held down by two fine brass bolts. When the stirrer bar D (a 7-mm. length of sewing needle sealed in a short piece of melting-point tube) is dropped into the titration vessel standing centrally upon the platform, the stirrer bar follows the rotation of the magnet. Since the agitation is greatest at the bottom of the solution, highly-efficient stirring without splashing is obtained.

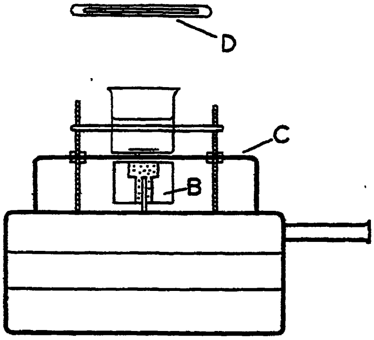


Fig. 7

Bottle Caps

Mr. Fill described various clamps and stands for microchemical apparatus[7]. These are constructed mainly from glass rod and bakelite reagent-bottle caps. A typical example (Fig. 8) is designed to permit the inverted vacuum-motor stirrer E to be lowered into position. On turning knob F projecting from bosshead G (yet another pair of bottle caps!), the glass-rod hairpin upright moves up and down. Movement is accomplished by two small rubber rollers pressing upon the sides of the upright.

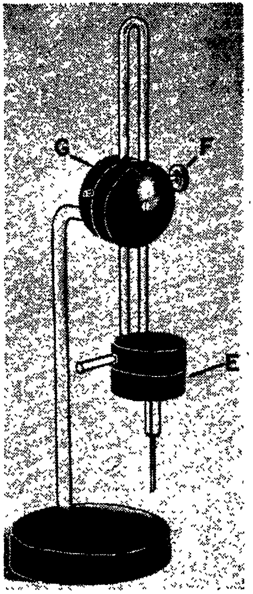


Fig. 8. More ingenious and effective use of bottle caps

An improvised microburette[8] was also exhibited. This is of the tapless variety and is constructed from a 1-ml. graduated pipette. Delivery is controlled by the operation of an ordinary screw clip.

Hydrogen sulphide delivery systems[9] were discussed by Mr. P. Heath. Treatment with hydrogen sulphide may be effected either by allowing the gas to bubble through the solution or by the "pressure" method. For the first method, Mr. Heath described a modified Lidstone-Wilson generator.[10] In place of the usual tapered delivery tube, a fine parallel capillary, easily drawn from scrap glass tubing, is employed. After use, the capillary is thrown away, thus eliminating any risk of contamination.

The arrangement is shown in Fig. 9. Having sealed the end of the generator side arm projecting beyond the stopcock, a hole some 3 mm. in diameter and inclined downwards at 45° is blown near the end. A diaphragm is then formed over the hole by slipping on a short length of thin rubber tubing. Using a red-hot needle, the centre of the diaphragm is punctured and marked with a white-ink cross. On thrusting the end of the capillary into the hole, secure gas-tight gripping occurs.

Because of the favourable area-to-

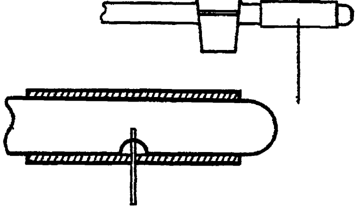


Fig. 9. Parts of the hydrogen sulphide delivery system

volume relationship of small samples, the "pressure" method of saturating solutions with hydrogen sulphide is very efficacious on the semi-micro scale. Precipitation is carried out in a micro test tube using a short length of glass tubing as a delivery attachment. One end of the latter is connected to the generator, the other carrying a stopper of rubber tubing fitting snugly into the mouth of the test tube.

Having first displaced the air above the solution by easing the stopper, the latter is thrust firmly home and precipitation completed by gentle tapping. This method does not require high-pressure hydrogen sulphide and works well with an ordinary Kipp generator.

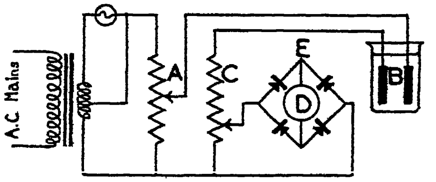


Fig. 10. *Circuit for conductometric titration*

Apparatus for conductometric microtitration[11] was described by the author. The circuit of the titration unit (Fig. 10) is based on the well known principle of applying a fixed voltage to the conducting system, when the current flowing is directly proportional to the conductivity.

Potentiometer A, connected across one portion of the secondary of a bell transformer, enables any a.c. voltage up to 2.5 to be applied to the electrodes B. Potentiometer C controls the sensitivity of meter D, which is a 0-1 mA moving coil instrument. To enable the latter to respond to a.c., an instrument rectifier E is incorporated in the circuit.

Micro-electrodes,[11,12] constructed as shown in Fig. 11, from two melting-point tubes and a few inches of platinum wire, are used. Two short lengths of cycle valve tubing FF and a bead of glass G hold the assembly rigid. Such electrodes may be bent for use in samples of limited depth and are platinised in a few minutes. Because of their small effective area, the electrodes do not behave well in highly conducting solutions, obtained with solutions of moderate conductivity (*e.g.*, solutions from N/1000 to N/100 with respect to strong acids).

Fig. 11

Having immersed the electrodes in the solution, the applied voltage is adjusted until a suitable meter reading is obtained. If the conductivity is expected to decrease during the titration, this reading may conveniently be full scale. The titrant is then added in portions, the meter reading being noted after each addition, and the titration curve plotted from the pairs of meter and burette readings. Besides the vacuum-operated version described, two electrically-driven models,[13] one for bench use and the other designed to fit into a retort ring, were exhibited.

REFERENCES

[1] G. Ingram, *Metallurgia*, *41*, 54 (1949).
[2] A. J. Lindsey and H. T. S. Sand. *Analyst*, *60*, 739 (1935).
[3] W. T. Chambers. (In course of publication.)
[4] *See, for example*, R. F. Milton and W. A. Waters, "Methods of Quantitative Micro-Analysis," Arnold, London (1949).
[5] A. C. Mason, *Analyst*. (In the press.)
[6] J. T. Stock amd M. A. Fill, *Metallurgia*, *41*, 239 (1950). *See also Analyst*, *74*, 318 (1949).
[7] *Metallurgia*, *41*, 290 (1950)
[8] 170
[9] J. T. Stock and P. Heath, *ibid.*, *41*, 171 (1950); J. T. Stock, P. Heath and W. Marshment, *ibid.* (in the press).
[10] A. G. Lidstone, C. L. Wilson and D. W. Wilson, *ibid.*, *35*, 171 (1947).
[11] J. T. Stock, *ibid.* (in the press).
[12] J. T. Stock, *Analyst*, *73*, 600 (1948).
[13] J. T. Stock and M. A. Fill, *ibid.* (in the press).

NEW TRENDS IN INSTRUMENTATION

(*continued from page* 604)

A new possibility for leak detection, still in the laboratory stage, is presented by an American apparatus for the detection of certain gases, particularly halogens. This consists of a measures the conductivity of air at ordinary atmospheric pressures between a hot platinum electrode and a cold electrode, the positive ion current being recorded.

It has been found that a minute quantity of certain gases, notably halogens. causes a large increase in conductivity. A minute quantity of one of these detectable gases is introduced into the vessel to be tested, and any leak will allow the gas to pass through the meter and be recorded.

Another notable development is the use of radio-active isotopes for determining the structure of synthetic molecules. This is calling into being an entirely new range of instruments of great importance to the chemist in the development of electronic computors for doing the calculations which are involved in evaluating the analyses of complex molecules by X-ray spectroscopy. The mathematical analysis of the results is exteremly complex and would take months or even years.

THE SYNTHETIC WAXES

Attempted Classification and Definition

IN a comprehensive paper on synthetic waxes read before the Centre de Perfectionnement Technique and now published (*Chim. et Ind.*, 63 (3), 1950, 239-245) Dr. L. Ivanovszky, of Abril Corporation (Great Britain), Ltd., endeavoured to introduce some order and clarity into a branch of chemical industry in which hitherto confusion and the absence of logical definition have been conspicuous.

Starting with the question of definition, he proposed this: *Waxes are a specific group of organic thermoplastic substances, mostly opaque, with m.p. usually between 50° and 90°C., but sometimes (exceptionally) up to 200°C., yielding liquids of relatively low viscosity without ropiness or filamentation, and forming pastes (dispersions) or gels, having generally lustrous properties.*

Characteristic constituents of most waxes are long-chain paraffins and their derivatives—including normal and iso-hydrocarbons, alcohols, ketones, acids; also ethers, esters, and pseudo-esters with aliphatic and aromatic compounds. Most waxes should, moreover, be regarded as polymers, aggregates and/or "alloys," this latter term being used advisedly in view of the close analogy between waxes and true alloys. But much yet remains to be elucidated on the structure of waxes.

Defining "Synthetic"

Waxes may be classified as (a) natural-animal, vegetable, mineral, (b) refined (natural), (c) chemically modified, (d) synthetic, (e) compound. The term "synthetic" should be restricted to waxes which differ essentially from the raw materials used and result from chemical processes which are often complicated. From the strictly scientific point of view they are to be regarded as products of important chemical changes and partial synthesis. At present there are strictly only three synthetic processes: hydrogenation of a carbon oxide (FT waxes), low temperature hydrogenation of carbon (TTH waxes), and ethylenic polymerisation (Alkathenes, Polythenes, Lupolenes).

The conversion of these hydrocarbon waxes into those of fatty acids, alcoholic or ketonic waxes, or of esters or other condensation waxes, leads to a series of purely synthetic waxes, if the hydroxylated constituents used are themselves synthetic; but the conception of true or purely synthetic is only of theoretical interest.

It is more important to inquire if the synthetic waxes are true replicas of the corresponding natural substances. In some cases this is so, as with the hydrocarbon waxes which are similar to paraffin wax; and in some other cases there are analogies or similarities. In such instances the synthetic product may be superior or inferior to its natural analogue, but in any case offers greater variety of properties.

The difference between the natural ester waxes and the synthetic resides in the fact that the latter contain various glycols, etc., but do not contain fatty alcohols of high molecular weight in appreciable quantities. Some therefore are completely saponifiable, while others (pseudo-esters) are practically unsaponifiable. Some qualifications of these terms in respect to waxes are discussed.

Intermediates and End Products

In regard to other characteristics or constants, those usually listed are insufficient to distinguish or evaluate waxes. The author briefly deals with some new ones recently introduced, such as *Rn* and *Re*, retention index (or number) and retention effect respectively.

Diagrams illustrate the relations between raw materials, intermediates, and end products in the manufacture of synthetic waxes. In many cases, end products or waxes serve as intermediates for other synthetic waxes or mixtures. A table gives names and classification of a large number of waxes, including many I.G. types, as well as those of Abril, I.C.I., Ltd., etc., with notes on composition and manufacture. These are classified under the different heads: fatty acid, esters, pseudo esters, ethers, ketones, etc.

An important property in evaluating waxes is their melting point, although its importance can be exaggerated, for the tacit assumption that this implies other properties is sometimes invalid. Another important feature is colour. The synthetic waxes are supplied to very definite specifications, of precise chemical composition and characteristics. They often possess properties whih cannot be claimed for analogous natural products.

The author concludes with the important question of raw material costs, with special reference to the I.G. products, many of which were available only in relatively small quantities.

Radioactive Isotopes in Industry

Emergence of Experimental and Practical Equipment

by K. FEARNSIDE, M.A., A.M.I.E.E.

SINCE the construction of atomic piles, radioactive materials which were formerly produced by laborious and costly refining of minerals have become available in almost unlimited quantities. The use of naturally occurring radioactive materials was confined almost entirely to pure research and to therapy, whereas the artificially produced materials from the atomic piles is finding an ever growing number of uses throughout industry generally.

Nowadays it is believed that almost the entire mass of an atom is concentrated in the centre at the nucleus. It is found that the chemical behaviour of the atom is governed by the number of protons in the nucleus, which are therefore chemically identical, but have different numbers of neutrons and so different weights, and are known as isotopes of one another. A distinction is made between them by putting the weight after the name or chemical symbol of the element. Bromine, for example, has nine known isotopes, only two of which are stable—Br^{79} and Br^{81}.

The number of neutrons has, however, a controlling effect on the nuclear properties of the atom, and if there are too many or too few neutrons compared with the number of protons, the nucleus will be unstable and will endeavour to reach a stable state by the emission of radiation. Most materials when placed in an atomic pile will absorb some neutrons and become unstable.

Three Types

The radiations which are emitted depend on the radioactive isotope concerned and fall into three classes, α, β and γ. α radiation consists of fast moving helium nuclei and is associated chiefly with the naturally radioactive elements. β radiation consists of fast moving electrons having a maximum energy which varies from one radioactive element to another.

Their range in air is about one metre, depending on the energy, and it is correspondingly less in denser materials. In passing through matter they collide with and knock electrons out of the atoms in their path, causing the material to become ionised. γ rays are electromagnetic radiations of the same nature as X-rays but having a shorter wave length because of their greater energy. They are only slowly stopped by air or other matter, which they ionise to a much smaller extent than do β rays. Some radio isotopes emit both β and γ radiation, while others emit only β radiation.

The other characteristic of a radio isotope is its half-life. This is the time during which the number of unstable atoms originally present decays to half and varies from a fraction of a second to millions of years. For practical use, values between a few hours and a few years are normally chosen.

Radio isotopes are detected and measured by the ionising effect of their radiations. Two instruments are commonly used—the ionisation chamber and the Geiger counter. The ionisation chamber consists of a chamber filled with gas at one or more atmospheres pressure and having conducting walls and central electrode insulated from them. A sufficient voltage is applied to the central electrode to ensure that any ions formed in the gas will be collected by it, so that the current in the chamber is proportional to the amount of radiation passing through it. The Geiger counter, on the other hand, is a chamber filled with a mixture of argon and ethyl alcohol or other suitable gases at a pressure about one-tenth of atmospheric.

The central electrode is normally a very fine wire at a positive potential with rays

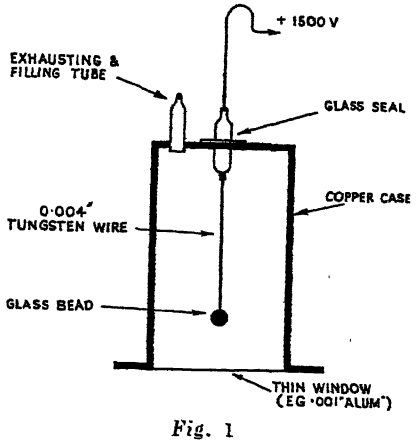


Fig. 1

to the case (see Fig. 1). When an atom is split inside the counter the resulting electron is violently accelerated towards the centre wire and ionises more atoms in its path. This means that for each β ray which enters the counter a large burst of electrons strikes the centre wire.

This is in effect a pulse of electric current and can be amplified and made to operate a meter so that each incoming β ray is actually counted. The mechanism of counting γ rays is similar but because of the small amount of ionisation along their path only about 1 per cent of the incoming γ rays will be counted.

Great Sensitivity

Because each β ray which enters a counter can be counted, it follows that very small quantities of active material can be detected and measured. In fact, about 10^{-15} gms. of active material with a half-life of 10 days can be measured with an accuracy of 1 per cent using normal techniques. A small quantity of active material can therefore be used to detect the presence of inactive material of similar chemical composition and study its path through a series of reactions.

The classical example of the tracer method is Hevesy's study of the uptake of lead in shoots of the horse bean, which were carried out in 1928. Plants of the bean were grown and the roots were placed in solutions of lead nitrate mixed with thorium B nitrate (thorium B being a naturally occurring radio isotope of lead which emits both β and γ rays and has a half-life of 10.5 hours). After periods of some hours the plants were washed with distilled water, the individual parts were ashed separately and the radioactivity present was measured by means of an electroscope. The thorium B solution would, if carrier free, be about 10^{-12}N with respect to lead.

Some results extracted from Hevesy's table for the translocation of lead in carrier solutions of different strengths are given in Table 1. The lead content of different ashes is estimated by the radioactive materials present. By comparing the lead content of leaf and root ashes the conclusion may be drawn that the roots can hold back small quantities of lead from getting through to the rest of the plant. From stronger solutions, however, a greater proportion of the lead gets through the roots to the leaves.

Strength of $Pb(NO_3)_2$—Percentage Content of Ash

	Root	Stem	Leaves
10^{-6}N	0.052	0.0001	0.00002
10^{-5}N	0.26	0.002	0.0003
10^{-3}N	10.0	0.04	0.004
10^{-2}N	38.0	20	12.0

In the industrial field the tracer technique is already widely employed in the laboratory as a means of studying chemical reactions but has not yet been widely applied to the study of process efficiency on the manufacturing scale. A certain company was in the business of liquefying air and separating its components. In addition to liquefying nitrogen and oxygen, it was interested in recovering the noble gases such as krypton and xenon.

The demand for these gases exceeds the available supply, since there is only one-tenth of a part of a million of krypton and one-hundredth of a part per million of xenon in air. This particular company found that there were only small proportions of the available krypton and xenon being recovered in their plant, and wished to find out where these materials were going in the process and how to effect their recovery.

Radio active krypton and xenon were introduced in a fixed proportion with the incoming air prior to liquefaction and the air was analysed at different points in the process be means of a Geiger counter. This enabled the krypton and xenon present to be determined with an accuracy at a few parts per billion of air, since the radioactive krypton and xenon introduced remains in a fixed proportion to the known radioactive krypton and xenon which is naturally present in air. As a result of these analyses, process efficiency was greatly increased.

Control by Radio Isotopes

The continuous measurement and control of the weight of sheets of material moving at the speed normal in most manufacturing processes has been a difficult problem for a long time, but this has been solved by the use of radio isotopes.

As stated above, when β radiations pass through matter they collide with the atoms in their path and remove electrons from them. In this process the electrons which constitute the β radiation lose energy and are eventually stopped. Their range depends only on the density of the matter in which they are moving, and is usually quoted in mg. per sq. cm.

When a radio isotope emits β radiation. not all the electrons which constitute the radiation have the same energy, and in fact for thallium the distribution of energies has the shape shown in Fig. 2 (*overleaf*). This means that, in passing through matter, some of the electrons will be stopped and the fewer will get through.

If a source of β radiation is placed beneath a sheet of material and an ionisation chamber is placed immediately above it the rate at which radiation enters the chamber will depend only on the weight per unit area of the material interposed. For control purposes the current may be shown on a meter which has been calibrated previously with various weights of paper, so that the operator can correct the weight, or can be used to operate a suitable servo mechanism.

Since the source has a finite half-life, it is necessary to recalibrate the meter at frequent intervals if inaccuracies are to be avoided. This may be inconvenient in certain circumstances and can be avoided by the arrangement shown in Fig. 3, where a standard piece of material is used as a reference.

Different isotopes are necessary for different ranges of weight. For weights up to 150 mg. per sq. cm., thallium 204 may be used. This isotope has a half-life of 2.7 years and emits β radiation of 0.87 million volts maximum energy. Other isotopes may be used for even greater weights.

Dissipating Static Charges

Static charges build up on a fast moving belt of paper because electrons are torn from the atoms of either the paper or the rollers over which it passes. Thus static electricity is caused by either a deficiency or excess of electrons on the surface of the paper. When β particles pass through a gas some electrons are separated from their parent atom and the gas is said to be ionised.

If this ionisation occurs in the neighbourhood of a sheet of static charge, there is an attraction between opposite charges which come together and neutralisation occurs. If, then, as the belt moves along, the air surrounding it can be ionised to a sufficient extent, the static charges will leak away to the ground. This can be done most conveniently by mounting a radioactive material on a suitable backing and placing it so that the emitted β particles pass through the air immediately surrounding the paper.

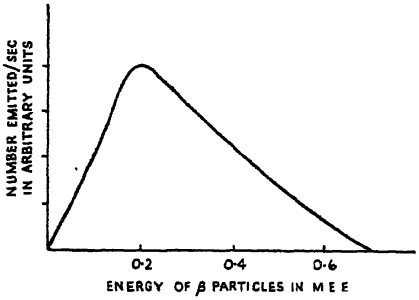


Fig. 2

As against other means of dissipating static charges, the radioactive method has several advantages. Although some time is taken for the sources to be produced in the Harwell pile (one to three months), they involve no elaborate equipment and they are inexpensive to buy. They require no maintenance and, although the activity of the source decreases over a period of time, they need to be replaced at intervals of time which will probably amount to a number of years. No high voltages are involved, so that the danger to personnel is avoided, and radioactive isotopes are chosen which are pure β emitters, so that radiation health hazard is negligible.

Because of its reasonably long half-life and high specific activity, thallium 204 is one suitable isotope to use. Replacement is necessary every three or four years.

It is hoped that this brief explanation has shown some of the possibilities made available to the large-scale production of radioactive isotopes. To encourage these uses in industry, Isotopes Developments,

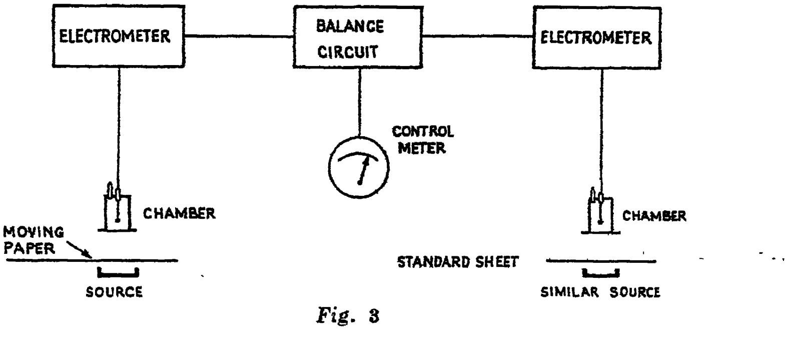


Fig. 3

Ltd., was recently formed with the backing of a group of large industrial undertakings with three specific objects.

The first of these is to advise firms wishing to undertake tracer experiments on the best way of carrying out the experiments they have in mind, and to supply a complete range of equipment for experimental purposes. Then, for those firms which will benefit from experimental work of this kind but who do not wish to undertake the work themselves, the company proposes to carry through complete investigations either in their laboratories or in the works of the firm concerned, and provide the equipment, the isotopes, and the scientific effort necessary for the investigation.

This company also develops and manufactures new instruments for process control in which isotope techniques are used. The Beta gauge for measurement of weight per unit area, described above, is the first of these.

Chemical Development in U.S.A.

NEW chemicals now reaching large-scale production for the first time were reviewed by Mr. Harry B. McClure recently at the annual meeting in New York of the Commercial Chemical Development Association.

The occasion was the presentation by the president of the association of its first honour award to Mr. McClure, vice-president, carbide and carbon chemical division, Union Carbide and Carbon Corporation.

In his address "Recent Case Studies in Chemical Development," Mr. McClure showed that of 42 products sold in carload or tank-car quantities for the first time in the last two years the average rate of progress from test-tube stage to tank-car production was five to six years. In six cases, however, the time taken from initial drum shipment to carload stages had taken only two years.

The great interdependence of the chemical industry was also emphasised by the speaker. Over half the new products were sold as raw materials to other manufacturers, he said.

The official record of sulphuric acid production in the U.S.A. shows considerable increase. Production in January exceeded 1000 million tons for the first time in history during that period. This represented an increase of 41,500 tons over December, while the total gain was only 24,000 tons. This apparently means that production by the chamber process dropped in a period of over-all production increase.

TOWARDS COLLABORATION

International Chemistry Unions

THE fact that many British scientists were ignorant of the very virile bodies, the international unions collaborating for better understanding of scientific matters, was deplored by Dr. L. H. Lampitt in his address to the Society of Chemical Industry last Monday.

The doctor, whose subject was "Towards International Collaboration in Science," was presented with the International Medal of the society.

Societies and movements for international collaboration had come and gone, he said, but the first really influential body was the International Association of Academies which was followed by the International Research Council and finally by the International Council of Scientific Unions (ICSU).

In 1948 the International Union of Pure and Applied Chemistry was given its present status, with commissions divided into six sections, physical, inorganic, organic, biological, analytical, and applied chemistry.

Dr. Lampitt said that in spite of himself, he had been made president of the applied chemistry section through the defection of the U.S.S.R. nominated delegate who had not put in an appearance for nearly two years.

The urge to collaborate exists, declared the doctor, but two world wars in less than half a century had made things difficult. The main essentials for the success of the international unions were that politics must be excluded; control by scientists as representatives of governments must be avoided; they must be autonomous, they must be willing to work; and further steps must be taken to gain the interest of the national societies.

German Instruments

THE German apparatus exhibition (Achema X—Ausstellungs-Tagung für Chemisches Apparatewesen), to be held at Frankfurt, July 9-16, has been assured of support by 350 of the leading German firms specialising in the manufacture of chemical plant and laboratory apparatus. The building of an additional hall to accommodate the show is contemplated. Papers and symposia will be read on various aspects of scientific equipment supply and use, including some innovations; and special travelling and residence facilities will be available to German and foreign students.

ORGANISING THE INSTRUMENT SECTIONS

Erection and Maintenance of a Large-Scale Unit

by V. H. BROWN, M.I.Mech.E., M.S.I.T.

DURING the past eight or nine years I have been closely associated with the instrument organisations of two large chemical plants, the first being at a wartime factory for producing aviation fuel at Heysham, and the second at the new ICI factory at Wilton.

The Wilton factory is still in its infancy, and most of our energies so far have been directed towards general organisation, design and erection. I propose therefore to give some account of the Heysham factory, particularly from a maintenance aspect.

While we think that these organisations are good, we do not suggest that they are perfect—neither do we suggest that an organisation which is applicable to a completely new plant is necessarily right for existing plant, where adaptation and modification is usually the line of attack rather than setting up something completely new.

On the other hand, every factory has a large number of bread and butter instruments such as flow, temperature and pressure measuring instruments, and the main points of difference lie in treatment of " specials."

War Installation

Round about the outbreak of war the Government ordered the erection of a plant to provide high octane spirit for our Air Force. The plan was based on the hydrogenation process, gas oil imported from Trinidad being the raw material.

Hydrogen for the main hydrogenation process was produced from coke in six large water gas generators. Hydrogen after purification was compressed to about 5000 p.s.i.g. in 5-stage machines. There were 5 hydrogenation process units.

Two four-column frationation units separated the products of hydrogenation into butane, aviation base stock and recycle material.

Instruments installed were very largely standard to the type of plant put down. By far the majority of flow measurements were by sharp edged orifice plates (though there were a few venturis), coupled to proprietory flowmeters. On the high pressure gas side an ICI designed type of ring balance flowmeter was used.

Similarly pressure measurement was by bourdon tube gauges, and temperatures by thermocouples and resistance elements.

While the hydrogenation side had very few automatic controls, the distillation side was practically 100 per cent automatically controlled—on temperature, pressure and level in towers and furnaces. Here again, however, the instruments were essentially standard proprietory units, mostly Foxboro and Kent two term controllers—we had no three term controllers.

Regarding analysis instruments, the katharometer type was used for hydrogen determination on the gas make up system and also on the CO_2 in flue gas on the boilers.

Special Instruments

We had several special type instruments. One to give a record of the CO content in make up gas with an accuracy of parts per million; this was an elaborate set up with a lot of vulnerable glasswork, which needed quite a lot of attention to maintain it in a working condition—the results were so important for plant operation however that the excessive maintenance was considered worth while.

Another special instrument was one affectionately referred to as the " baby "—a unit devised to give an anticipated H_2 content of a mixture of gases after passing through a catalytic process. Then there were several *p*H meters—one of the raw water supply of the antimony electrode type, used to control the *p*H of the incoming water to the factory.

I frankly can't give you actual numbers, but you will gain some idea of the extent of the instrumentation when I tell you that the installed value was approximately £250,000.

Our personnel was drawn from two main supplies; firstly from fairly well trained men from the parent companies (ICI and Shell); secondly from local labour. The total number was of the order of 70-80, which included artificers, attendants, relaxees, apprentices, records and staff. I shudder to think what we should have done in the early days without that nucleus of trained men from the parent companies.

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* Abstracted from a paper delivered to the Society of Instrument Technology at a meeting held in London on April 25 by Mr. V. H. Brown, instrument manager, Wilton Works, I.C.I.

We had two instrument stations at Heysham. The Central Instrument Station located on the hydrogenation site, and a second station on the refinery site. This consisted of an ex army hut split up into an office and small sub store at one end, the remainder being divided into two work rooms, one for heavy and the other for light calibration work.

The Central Instrument Station was well designed. I should like to make a special reference to the advantages of locating the Instrument Store in the Station. Walking time and working time is saved; faults in incorrect ordering are more quickly remedied; unloading of instruments under a trained eye is invaluable; closer co-operation between instrument foremen and storekeeper can be maintained, a helpful factor when dealing with specialist instrument stores.

Calibration

A detailed description of calibration apparatus and methods does not form part of this paper; it is a most important subject, however, and brief mention of some of the apparatus in use at Heysham will not, I feel, be out of place.

Flow: For routine calibration in the shop we had a number of brackets fixed to hold the various types of flowmeters. Adjacent to these were arrayed a series of vertical manometers—up to about 100 in. water for meter ranges up to this limit, and Hg manometers for higher ranges. After cleaning and reassembly, the H.P. leg of the flowmeter was connected to the appropriate manometer and a compressed air supply, and several check points taken throughout the range; the LP leg was left open to atmosphere.

All orifice plate calculations were made in the station, using data available to ICI companies; this data is the result of a large amount of experimental work carried out at Billingham over a long period.

For calibrating pressure gauges and recorders we had the normal dead weight testers for medium and high pressures, and Hg manometers for LP gauges. For rapid, less accurate testing, standard gauges were used on a common system in which could be connected, say, half a dozen gauges, pressure being supplied from compressed air or foot pump.

Temperature: Measurements were mostly by thermocouple or resistance bulb on the hydrogenation site, and by vapour or liquid in steel bulbs on the refinery site.

For checking we had standard workshops potentiometers, potential dividers, Wheatstone bridges and ancillary equipment for checking resistances; general purpose test meters like avometers; test coils for the resistance element units; oil baths for the steel bulb types; and so on.

For katharometers and gas density recorders we used cylinders of gas, filled with appropriate gas mixtures to about 100 atms. This gas was then passed through the katharometer head, one cylinder being used for zero and a second for full scale deflection.

In view of possible CO_2 condensation troubles, a cylinder of about 2 per cent H_2 in N_2 was made up for checking the CO_2 kaths on the boiler flue gas. The effect of H_2 in air is approximately 7 times that of CO_2 in air in the reverse direction; therefore by using a 2 per cent H_2 gas, and reversing the recorder leads, a reading of approximately 14 per cent CO_2 was obtained (which was the figure at which the plant was working). This test was a comparative rather than absolute check.

A rough test rig for checking tachometers was also set up, using a small synchronous motor and gear wheel trains.

A large number of our controllers were of the Foxboro air operated type. A small test rig was set up for checking the pilot valve setting, i.e., to adjust the pilot valve movement, to give a full outlet air pressure variation of, say, 0-15 p.s.i. for a flapper—bellows system pressure variation of about 2 p.s.i.

For checking positive meters we had some carefully calibrated orifice installations, and also some calibration tanks.

I think the work of the Instrument Department at Heysham can probably be sectionalised under three main headings: normal maintenance, preventive maintenance and records and general office work.

Twenty-four Hour Service

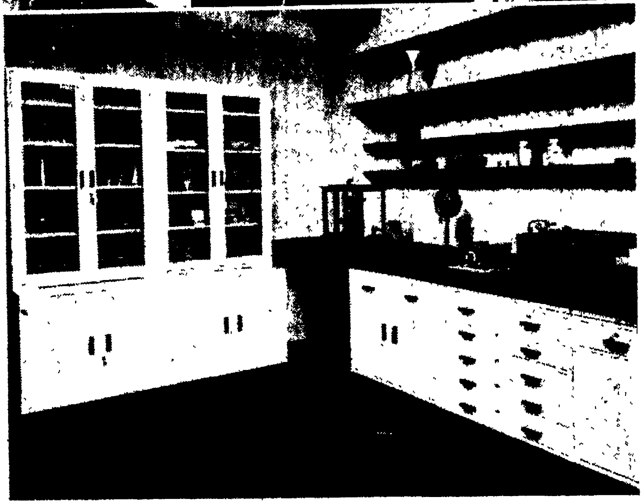
In normal maintenance where plant is operating continuously 24 hours per day it is usually necessary to employ shift instrument men; on a large plant, there are invariably some key instruments which, if out of commission, would seriously inconvenience plant operation. Plant can, however, usually continue to operate for a few hours without a number of instruments, and such instruments can be left over for day attention should they go out of commission during the night.

Even more important is it to maintain automatic controllers in commission; it is usually difficult to hand control normally automatically controlled plant and sometimes impossible, apart from the fact that there is often not the available process labour.

At Heysham we had both key instru-

(continued on page 618)

Functional Design in the New Laboratories



Nothing distinguishes more clearly the conditions in which research is carried on today from those of the recent past than the functional form of the most modern laboratories. The principles are well illustrated in these views in the pathological department of the Royal Free Hospital (1,2,3) and the analytical research laboratories of Yardley & Co. (4,5) employing the stove enamelled steel unit furniture which can be adapted to changing needs. Counterparts are going to the Department of Health in Ottawa. (Photographs by courtesy of Baird & Tatlock (London), Ltd.)

ORGANISING THE INSTRUMENT SECTIONS

(continued from page 616)

ment and fully automatic controlled plant, and we ran a shift of artificers. The shift men at Heysham kept logs of all work dealt with; their primary function was to maintain instruments in operation, making a good permanent repair where possible, and in other cases a temporary hook-up sufficient to last overnight.

The day staff dealt with any of this latter work, and any other repair jobs which arose. In addition they covered maintenance and adjustment of the more complicated types of instruments.

Our semi-skilled instrument men are known as attendants. These men are recognised by the unions, of which they are members; they are paid agreed fixed percentage of the full trade rate. Their work comprises such jobs as chart changing, checking flowmeter zeros, blowing catchpots, attention to pens, greasing and generally assisting artificers. It will readily be seen that this class of labour is a great help in any maintenance organisation in saving artificers' time.

I have always deprecated the policy of allowing important instruments to remain in operation until they broke down and caused a plant restriction. The careful car owner either overhauls his car, or has it overhauled, periodically, to check various vulnerable components, and does not run it until it lets him down some dark night in a rainstorm.

Routine Overhauls

In the same way, key instruments were given a periodic overhaul at Heysham. Thus, flowmeters and temperature recorders, at periods varying between, say, six and 12 months according to experience and their importance to the plant, were brought into the shop for overhaul and recalibration. This procedure was applied also to pressure gauges, certain analysis instruments, level controls and some weight machines.

Record sheets were kept of such overhauls, which gave a brief history of the instrument, condition in which received at such periodic overhauls, account of new parts fitted, and so on.

I have seen tally systems, say, a board with instruments enumerated down the left hand side, with dates along the top, and a series of hooks on which could be hung coloured discs to draw attention to the dates of routine overhauls: some system of this nature can be quite useful.

Care should be taken, however, not to overdo these routine overhauls. Practically all instruments should receive periodic attention, but instruments should be graded and the period between overhauls varied according to the importance of the instrument to plant operation or costing.

One of the things which struck me during my visit to the U.S.A. some three years ago was the relatively small amount of routine maintenance. Plant managers were more content to operate their plant on trends or variations rather than absolute measurements; a further important point was that fuel costs, particularly where natural gas was being used, were relatively lower, so that plant efficiencies were less important than in this country.

At Heysham the records section was a separate department from instruments. Pressure, temperature and analysis corrections were applied to all flow charts in the instrument section, and all charts were planimetered in our section for average readings where required—flow, temperature and pressure. Also where non-normal balances or tests were to be made, then the help of the instrument section was called for.

Department Liaison

I think it is axiomatic that the closest liaison should be maintained between any records and instrument sections, and preferably that they should lie within one department.

The closest liaison between plant management and instruments is essential. You may think that this is so obvious that it need not even be mentioned; I have known many cases, however, where a good deal of trouble and misunderstanding could have been avoided by a short conversation and a few words of explanation, between the two sections.

At Heysham, apart from interchange of notes and telephone work, a short meeting was held each morning to discuss plant operations through the previous 24 hours, and any unusual maintenance or shutdown programmes for the day ahead; at this meeting were representatives from plant management, mechanical, electrical and instrument maintenance.

Foremen

And lastly a word about instrument foremen and chargehands: I find it difficult to express my appreciation of the work carried out by these men, with their wide practical knowledge, their ability to deal with all types of labour, and their willingness to get down to do a job of work themselves when occasion demanded. On the whole I found their help absolutely invaluable, and not least for the part they played in training raw recruits to become useful instrument workers.

PLASTICS IN THE LABORATORY

Successful Application of the Laminates

From A SPECIAL CORRESPONDENT

CHEMISTS, physicists, biologists and many other scientific workers are finding plastics of increasing value in the laboratory for making specialised pieces of equipment and experimental apparatus which cannot be made satisfactorily from so-called traditional materials, such as metal, wood, glass and ceramics. It is also interesting to note that manufacturers of laboratory benches and other furnishings are now supplying units made of laminated plastic sheets. These are built up of layers of kraft paper impregnated with phenol formaldehyde resin and bonded together under heat and considerable pressure.

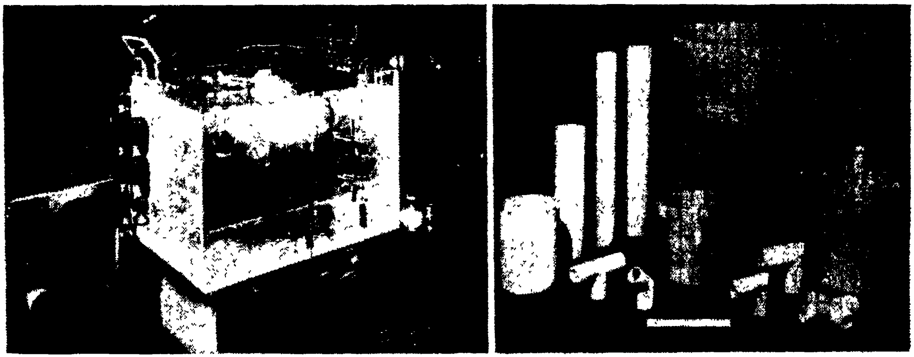
The laminated plastics material is superior to ordinary wood, such as teak, on account of its high strength-to-weight ratio, incombustibility, resistance to water and chemical attack, rigidity and resistance to twisting, warping and bending of its hygienic surface.

The laboratory bench is but one of the several new applications now being found for laminated sheet in this field. In hospitals, medical schools and lecture rooms this material is also used for wall panelling, doors and even electrical heating panels. The latter consist of heating units within the cavity of specially constructed laminated sheet known as Holoplast.

The heating panel can be fixed to all types of traditional building structures. However, should the walls, partitions or ceilings be formed of Holophast panels, the combination of the heating units with the novel girder-like structure of the laminated material results in building components which are not only structural, but which form the heating system at the same time.

The construction of the heating panel safeguards against scorch or burn through contact with the unit. The absence of induced air current, such as is experienced with conventional radiator heating, reduces the chances of infectious disease being carried throughout the building, which is important in a hospital, medical school, bacteriological and pathological departments, etc.

In some laboratories, use has been made of laminated board for the shelves holding chemical reagents. Several advantages are offered by this material for such an application. First, the laminated sheet is non-absorbent and resistant to attack by many corrosive chemicals and solvents. The surface of the sheet is hard, extremely smooth and easy to keep clean by merely wiping it over with a damp cloth. The material is available in a wide range of attractive and permanent colours, as well as black. The laminated panels are easily fitted, either to timber frames or to metal brackets. When fitted, the shelves are



[Courtesy of I.C.I., Ltd., Plastics Division

A thermostatically controlled water bath made from Perspex sheet (left) and pipes and containers in Alkathene naturally germicidal and do not provide a breeding place for germs. Moreover, they will resist attack by insects, such as termites, and fungus even in tropical climates.

For laboratory applications in the tropics there is no doubt that laminated plastics are of special interest, offering many practical advantages not found with any type of wood. The laminates are available in several different forms, the most important being the special cavity panels in Holoplast for structural work; veneers three sixty-fourths of an inch (1.2 mm.) suitable for application to a plywood core for the construction of doors, furniture or the surfacing of walls, tables and shelves; wall panels, five thirty-seconds of an inch (4.0 mm.) thick. The last named have a similar range of uses but are sufficiently strong and stable to be used without any backing material.

Instrument Panels

Another application found for laminated plastics in the laboratory is for instrument panels. Here the outstanding electrical characteristics of the laminate are of the greatest value. A typical high grade paper laminated sheet for insulation work has a volume resistivity (megohms/cm^3) 10^7 – 10^8; surface resistivity (megohms/cm^2) 10^6 – 10^7; power factor at 800 cycles (per cent) 1.5 – 3.5; dielectric strength at 90°C. (volts/mil.) 200-400; dielectric strength at 20°C. (volts/mil.) 400-600; breakdown along laminae at 90°C., 30-40 kV and dielectric constant 5.4-5.7.

In addition, this material possesses good mechanical strength, having 90 per cent of the tensile strength of aluminium, although only one-half the specific gravity. The laminated panels can be cut with a bandsaw or circular saw, drilled, turned and machined as readily as non-ferrous metal or hard wood.

One of the newest laminates consists of a glass fibre reinforced material, which is specially suited for use in electric motor armature end laminations and slots sticks because of its ability to retain its physical properties at high temperatures. Other uses are as switch washers, control switch plates and field coil end washers.

Perspex acrylic sheet, which is clear and transparent, is available in thicknesses from 1/25 in. to 1 in., and is finding many uses in the laboratory for the construction of apparatus. It is a tough, thermoplastic material, which softens at a temperature which is conveniently low for fabricating and working, but is sufficiently high to enable shaped articles to be used for many scientific purposes.

Sheets of Perspex can be cut with an ordinary carpenter's saw, or a band or circular saw, and machined with equipment normally used for woodworking. Cementing can be carried out very successfully by use of a solvent, such as chloroform, ethylene dichloride or glacial acetic acid, or a proprietary cement. The strength of cemented joints is excellent, and tensile tests have shown that they do not fail along the cemented surfaces, and that a fracture usually takes place at about two tons per sq. in., which is about half the normal ultimate tensile strength of the material.

In the chemical laboratory there is a growing need for a constructional material with all the optical properties of glass yet without its fragility and difficulty of fabrication. Acrylic sheet fulfils these requirements, with the proviso that it is not as a general rule safe to expose it to a temperature exceeding 75°C. Moreover, direct flame must never be allowed to play upon its surface as the material is, itself, inflammable, combustibility being rated about the same as hardwood.

Perspex is completely resistant to water, dilute acids (10 per cent nitric, 31 per cent hydrochloric acid, 50 per cent phosphoric, 25 per cent sulphuric, 50 per cent acetic and 25 per cent formic) and concentrated solutions of alkalis. No effect is noticed when this plastic is exposed for long periods to many of the common gases, including ozone and sulphur dioxide, but chlorine, particularly if moist, attacks the surface. Perspex is attacked by liquid hydrocyanic acid and solutions of chromic acid above 40 per cent chromic oxide. A number of organic solvents dissolve or soften acrylic resin and these are mainly of the aromatic hydrocarbon, ester, ketone or chlorinated hydrocarbon class.

Differing Rates of Expansion

In making laboratory apparatus out of Perspex, it is advisable to take some precautions in fitting and installation of the parts made of the sheet. For example, the coefficients of expansion of Perspex and metals are so widely different that allowance must be made for the relative movement of the Perspex when fitted in metal mountings. This plastic changes its length by 0.8 per cent over a temperature change of 100°C.

It is possible to calibrate Perspex vessels by engraving, sand blasting, embossing, printing or painting. By using hot tools, it is quite easy to die-stamp designs, etc., on to the cold sheet. For purely temporary marking, grease pencils have proved satisfactory, but care needs to be taken to remove pencil marks before heating, as otherwise the sheet will be stained.

In the biological laboratory, Perspex is of considerable value as it is such a convenient material for making many types of experimental apparatus, *e.g.*, containers for entomological research. Transparent acrylic sheet is a favourite material for constructing rearing chambers for house flies, *Musca domestica L.*, and other insects in order to evaluate insecticides and repellents.

The physicist uses Perspex for building many types of electrical apparatus. Here the excellent insulating characteristics and good mechanical properties combine to make it very suitable for constructing prototypes. of new testing apparatus. It is surprising the number of uses this material finds in the modern physical testing laboratory.

Aspherical Plastic Lenses

Various types of optical systems, some of them embracing the use of aspherical lenses, can be produced in acrylic plastics by novel casting methods. Inspection lenses are now being manufactured which employ these very accurate aspherical plastic lenses, which are able to reduce eyestrain imposed by close work. Crystallographers will find these new magnification lenses of considerable value.

Biologists, pathologists, entomologists and other scientific workers make use of acrylic resin for embedding specimens. In principle, the method is simple, consisting of immersion of the specimen in methyl methacrylate monomer or syrup. When this is very slowly heated in an oven for several days at 40°C. polymerisation takes place and the specimen is then firmly embedded in a transparent block of resin. This can be polished and mounted if required. Although the principle of the method is essentially simple, in actual practice it is difficult to achieve perfect specimens without a good deal of experience. The secret of success is to carry out polymerisation very slowly. Polyester resins can also be used instead of the acrylic for embedding work.

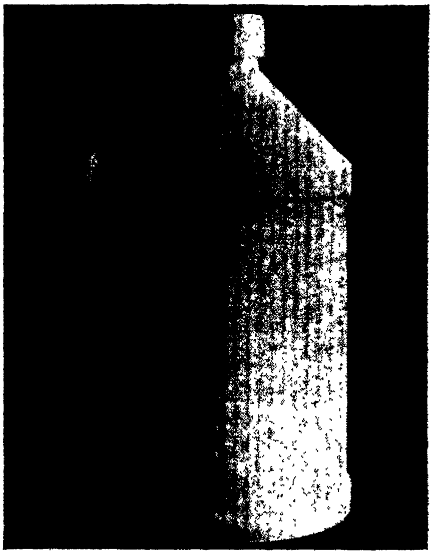
Most laboratory workers are now familiar with blown polythene bottles, beakers and other types of containers for holding highly corrosive fluids, such as hydrofluoric acid. These vessels are light (0.92 at 20°C.) and yet virtually unbreakable. The melting point of this thermoplastic is 110-120°C. and it is not recommended for use at temperatures exceeding 65°C.

Polythene may be obtained in sheet form. This is sold in varying thicknesses; 1/16 in., 1/8 in. 3/16 in., ¼ in. and ½ in., and in one size only, 30 in. by 30 in. The sheet is available in natural or black, the latter containing a small percentage of carbon black. For lining tanks and making various kinds of large containers, it is possible to use either gas- or electrically-heated welding torches. By using these torches, sound welding can be achieved.

For containers and vessels the laboratory worker can provide spouts and handles made from polythene tube and welded to the container. Large unsupported vessels may be made from the thicker sheet and, if necessary, external straps of metal can be used at intervals to give reinforcement.

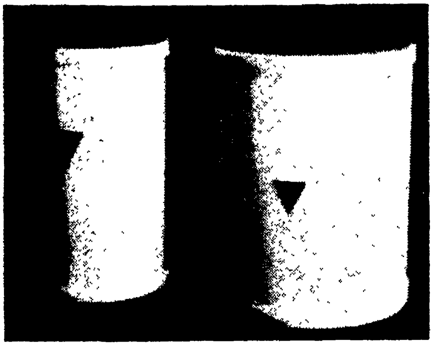
Polythene sheet cannot be cemented to the tank, and the lining therefore has to be of the loose type. It is, however, important that the lining should fit the tank exactly so as to ensure that the hydrostatic load transferred to the tank does not result in excessive tensile stress in the lining. No allowance is normally necessary for the relative thermal expansion of the polythene as the pressures of the enclosed liquid will prevent buckling of the sheet.

Extruded polythene tubing is now being used for water service lines and for conveying corrosive fluids. It is particularly useful for both mineral and organic acids, caustic alkalis and solvents up to 60°C. Unlike rubber, this thermoplastic remains



[Courtesy of Rediweld, Ltd., and I.C.I., Ltd.

One-gallon bottle made of polythene



Other forms of chemical containers by Rediweld, Ltd.

flexible down to as low as −70°C. for the tougher grades of polymer. Large diameter tubes and ducts can be readily fabricated from sheet by wrapping it round a wood former and then welding the seam, using hot gas and a polythene filler rod.

The new rigid or unplasticised grade of polyvinyl chloride possesses a high degree of chemical resistance and very satisfactory mechanical strength, including outstanding impact strength and good electrical properties. Although these properties of PVC are somewhat inferior to those of polythene, the PVC has the advantage of possessing a rigidity greater than polythene and similar, in fact, to wood. Unlike polythene, the rigid grade of PVC can be cemented with special solvents, and this makes for greater ease of fabrication. Welding can also be carried out using special techniques.

PVC and Polythene

PVC sheet is available in sheet sizes similar to those offered for polythene. The softening point (vicat) of this material is 90-95°C., and it is generally recommended that vessels, pipes, etc., fabricated from PVC sheet should not be exposed to working temperatures in excess of 55°C. PVC is non-inflammable, whereas, of course, polythene is fairly readily combustible.

Polytetrafluoroethylene is an outstanding new thermoplastic of great interest to research workers who require a material for making gland packings, pipe jointing and valve seatings, also linings for tanks and other vessels which are able to resist chemical attack at elevated temperatures. PTFE possesses a number of quite unique properties. It is, for instance, chemically inert, thermally stable, non-toxic and possesses good mechanical properties and a low coefficient of friction.

Gland packings of PTFE meet the requirements of the most severe gland service conditions, being able to withstand the corrosive and solvent action of any known acid or chemical, even when they are handled at higher than average pressures or at temperatures as high as 450°F. or as low as −60°F.

When operating small distillation equipment for corrosive fluids, these PTFE packings are proving of exceptional value.

The silicone fluids (methyl polysiloxanes of varying chain length) are of interest to research workers who require water repellents, anti-frothing agents and low temperature lubricants which do not increase in viscosity to the same degree as petroleum based oils. Coatings of silicone of the order of 300 molecules thick can be "fixed" to glass by a simple baking process so as to leave the glass water-repellent.

The vapour of mixed methyl chlorsilones will achieve the same result when used in the cold. Concentrations of a few parts per million of silicone fluid will effectively prevent the frothing of oils and other compounds. Another silicone compound of interest to scientific workers is silicone rubber, which finds application as a packing and gasket. A recent and unusual use for this material is as a gasket for glass observation windows in refrigeration chambers. For this purpose use is made of an extruded silicone rubber gasket which is able to cushion large double sheets of plate glass for indefinite periods without loss of resiliency or deterioration due to chemical attack.

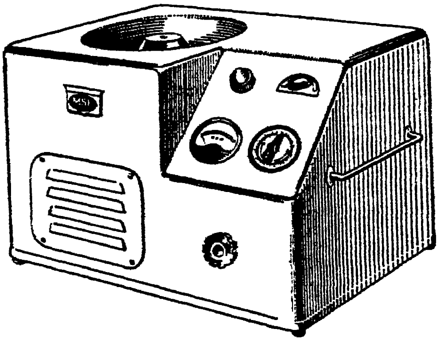
Manufacturers of small electrical appliances for laboratory use are showing an increasing interest in moulded nylon bearings, connecting rods and other moving parts. Weighing only one-eighth as much as metal, nylon provides the necessary strength, toughness and resiliency and, in addition, provides quiet operation either with no lubrication or with less than that required by other materials. In many cases, nylon offers cost savings over other materials on account of the ease with which it can be mass produced by injection mouldings, plus its lightness in weight and superior performance.

NEW LABORATORY INSTRUMENTS

Centrifuges and Visual Apparatus

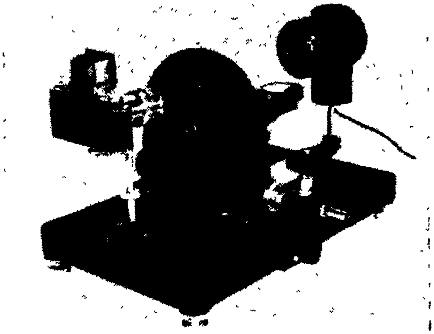
THE MSE high speed angle, laboratory type centrifuge, has been specially developed by MEASURING & SCIENTIFIC EQUIPMENT, LTD., for the increasing number of centrifuging jobs which necessitate extra high centrifugal force for fairly large quantities of material. It should, therefore, be particularly welcome to scientists engaged in bacteriological or similar work where the specific gravity of the suspended matter is such that separation would be impossible or too slow when using the usual types of centrifuges.

All controls on this instrument are conveniently grouped, there are no extraneous fittings, and a flexible mains cable is supplied for fitting to a 5 amp. plug. It is 17 in. (430 mm.) high, can be carried easily by means of the two handles provided, and is intended for bench use. Alternatively, and for even greater operating convenience, a low-wheeled trolley can be supplied. It has a maximum speed of 13,000 rpm, giving a maximum RCF value of 20,000 by gravity. One fully enclosed streamlined angle head (400 ml. capacity) is supplied which will carry 8 by 50 ml. tubes, or alternatively 8 by 7 ml. tubes (using sleeve adaptors).



MSE angle centrifuge

NOTABLE among modern instruments designed to meet the requirements of research in chemistry and related fields and believed to be novel in this country is the Neotron high-speed centrifuge (No. 106 A) of THOMSON, SKINNER & HAMILTON, LTD. This is claimed to give, in micro tests, a very much higher performance than other existing instruments. The principal feature of this machine is an air-driven rotor with an aperture in which a (transparent) cell, containing the test sample, is inserted. At a maximum speed of 20,000 r.p.m. at the usual air pressure of 80 p.s.i. for which the centrifuge was designed, the tested sample is subjected to a centrifugal force equal to approximately gravity plus 26,000.

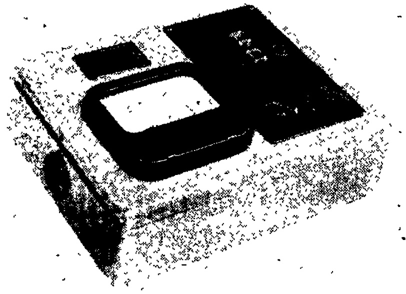


Neotron high-speed centrifuge

The special material of the rotor provides an ample safety factor at the maximum speed. Lower speeds can be secured by adjusting an air valve. The rotor shaft runs in precision ball bearings, mounted in a strong housing which safely encloses all revolving parts. Careful balancing of the rotor and the damping effect of the heavy-section base-plate ensure operation practically free from vibration. The r.p.m. can be checked by engaging with the extended rotor shaft the reliable tachometer provided. The rotor can be brought to rest within half a minute by means of a brake arrangement, fully enclosed and operated by a thumbscrew.

Photographic records of the test samples in various stages of sedimentation while the centrifuge is in motion, can be seen, a camera should be mounted on the adjustable bracket. By this means, sweep images are obtained of the samples under test. Sedimentation can be observed during running by fitting a ground glass screen to the camera in place of the 35 mm. film. Lighting is provided by a powerful projection lamp, mounted in the rear and focused on the cell through an aperture in the housing. Four cells of various capacities up to 0.35 ml. are supplied as standard with the centrifuge machine.

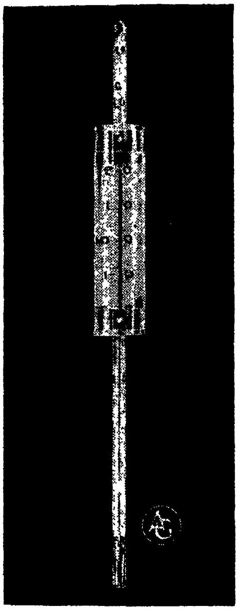
A PHOTOELECTRIC colorimeter (or absorptiometer) which A. GALLENKAMP & CO., LTD., has developed is designed to to offer all the advantages of modern photoelectric colorimetry at relatively low cost, without sacrifice of analytical precision. The instrument is neat and portable (about 8½ lb.) and is suitable for use in general analytical and clinical laboratories. It is a deflectional type instrument in which the ratio of absorptions of different solutions are indicated directly from scale readings, it being assumed that Beer's Law holds for all concentrations compared in this way. The circuit is designed to maintain linear response to light intensity. Coarse and fine controls give quick and easy adjustment for zero setting. A "safe" position is available for filter changing and to make the instrument safe for transport.



Gallenkamp photoelectric colorimeter

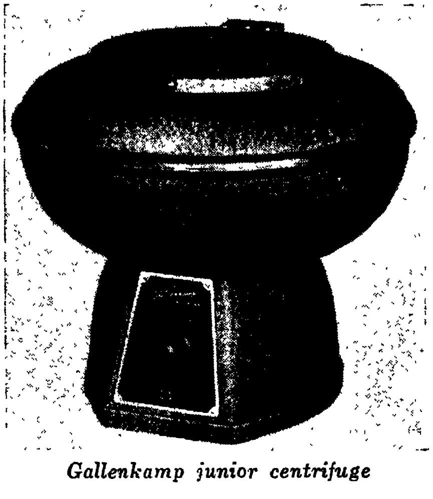
Designed for users requiring a reliable and safe—it having no exposed heads—yet inexpensive centrifuge to take tubes up to 50 ml. capacity, is a junior model by A. Gallenkamp & Co., Ltd. This has a maximum speed of 3000-4000 r.p.m., depending on the head used. It is precision built throughout from the finest materials and components, the makers claim. The action is fully floating on rubber bushes and the whole is mounted in a base casting, which also encloses a speed controlling rheostat with incorporated switch.

Listed as a new laboratory aid is the thermometer reader by A. Gallenkamp & Co., Ltd. This consists of a transparent plastic cylindrical lens with engraved index line. It fixes to the thermometer stem by means of spring clips, and will fit most solid stem chemical thermometers. It magnifies approximately 2-in. of the scale and allows the thermometer to be read at considerable distance.



Gallenkamp thermometer reader

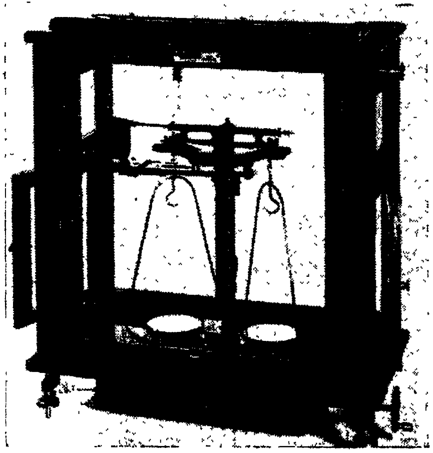
The Jackson Thermoregulator, also by A, Gallenkamp & Co., Ltd., is a mercury-in-glass electrical instrument intended primarily for laboratory use, but is applicable wherever fine temperature control is required. It is claimed to be free from the defects of the toluene regulator. To raise the range of the thermoregulator, mercury is transferred from the bulb to the annulus and *vice versa.*



Gallenkamp junior centrifuge

AN entirely new precision weighing instrument has recently been introduced by L. OERTLING, LTD., London. This aperiodic null-point chainomatic balance (model No. 101) is a modification of the company's well-established 48 GC type. The new balance has a sensitivity of 1 mg. and a capacity of 200 gm. in each pan. The aperiodic device employs a permanent magnet and metal vane fitted to the left-hand end of the beam. The magnet can be easily withdrawn to provide a normal free-swinging instrument.

The ideal analytical weight should be made of hard metal which is corrosion resistant to both oxidising and sulphur fumes and is non-magnetic. Nickel-chromium weights made by Oertling are claimed to be more durable than other metals. They are, of course, non-magnetic and adjusted to meet the specification of tolerance set up by the National Physical Laboratory. Fractional weights included with the nickel-chromium analytical weights are made of nickel-chromium wire down to 0.01 gm.

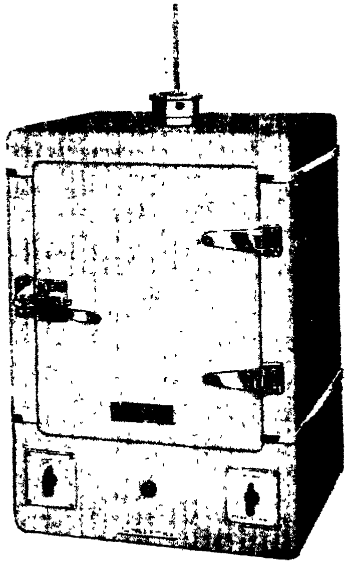


Oertling chainomatic balance Model 101

THE basic design of the balance has remained the same for many generations—a beam and two pans. With its model 200, J .W. TOWERS & Co., LTD., has introduced a radical change of design, namely, a single pan balance. This design achieves, in particular, constant sensitivity and constant load. It eliminates beam length errors, reading errors, and errors due to corroded or worn weights. It is claimed to be the most easily and rapidly operated balance made.

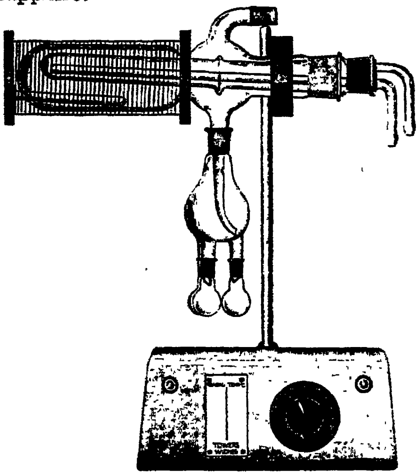
All weights from 0.1 to 199.9 gm. are operated from outside the case by means of four control knobs. There is thus no weight handling and no wear and tear on the weights. The load on the beam is brought to 200 gm. on every weighing by removing weights equal to that of the sample. The total of these weights is indicated on the direct reading scale. The weight less than 0.1 gm. is shown optically and automatically on the illuminated

Towers automatic direct reading balance Model 200



Towers universal electric oven

scale and can be read to 0.1 mgm. (half a division). The balance is air-damped and comes to rest quickly. The capacity of the balance is 200 gm. and the sensitivity 0.1 mgm. The planes are of synthetic sapphire.



Towers sloping condenser molecular still

The Towers universal oven is constructed of sheet steel, cream enamelled, with stainless steel interior. It is lagged with glass silk insulation and fitted with thermostatic control 0-180° C. or 0-300° C. with individually calibrated dial in degrees Centigrade. For uniform heating and safety the elements are placed at the bottom and sides of the oven and are totally enclosed.

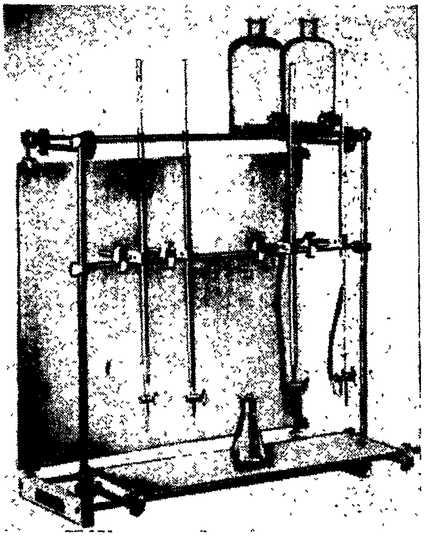
The Towers sloping condenser molecular still, designed by A. R. Gilson, M.A., is for distilling quantities up to about 100 gm. and is fitted with three flasks so that different fractions can be separated. The material to be distilled is placed in the part of the vessel which is surrounded by a Nichrome tape heating element, which permits clear visibility. The temperature can be controlled over a wide range by means of a transformer energy regulator.

AN air-damped micro balance, for which an exceptionally high degree of accuracy is claimed, has been perfected by **Stanton Instruments, Ltd.** This instrument, the M.C.1/A, offers easy accessibility to the pans, and provides external manipulation of weights up to 100 mgm. The ring rider weights used are of nickel-chrome wire—an extremely corrosion resisting, non-magnetic material. The new projection screen enables readings to be taken more easily. The graticule is divided into 200 divisions, each representing 0.01 mgm.

Although the claimed sensitivity of the instrument is 0.01 mgm., many micro-chemists are said to have found that estimations to within 3 micrograms can be made, since the divisions are fairly wide. The beam is of special lightweight construction giving added sensitivity. The balance has a separate beam chamber to reduce influence of heat and air currents on the beam. Very little heat is generated by the small low-power projection lamp, while illumination brightness is maintained at a maximum by means of a special lighting system and of the totally enclosed mirror housing.

CURRENT laboratory equipment by W. & J. **George & Becker, Ltd.**, in its Nivoc range, includes a new modified dip circle, which replaces the previous apparatus No. 16591. This now has a 6-in. (15 cms.) circular moulded base marked with four index lines at right-angles. The 5-in. (13 cms.) diameter dial is graduated and has an anti-parallax mirror. The needle mounting (of unit construction) rotates about a vertical axis with needle bearings of synthetic sapphire. The dip circle is supplied with two needles, one magnetised and the other unmagnetised. The apparatus has a height of 7¼ in. (18 cms.) and weighs 1¼ lb. (600 grm.).

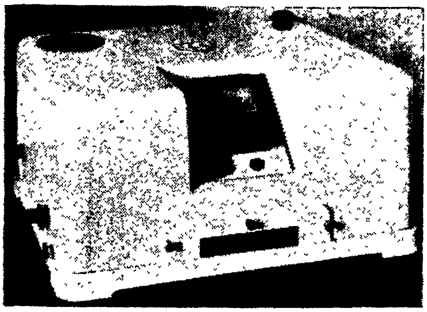
The Nivoc anti-vibration table (W. & J. George & Becker, Ltd., absorbs high and low frequency vibrations in the horizontal or vertical direction and will make possible the accurate use of balances in places



Kemiframe titration bench by W. and J. George and Becker, Ltd.

which would otherwise be impracticable. Vibration in those parts of laboratories or works where accurate measurements must be made will rarely approach such severity that the Nivoc anti-vibration table will not absorb it. Any balance with a total weight of up to 40 lb. can be used successfully on the table.—**BIF, Stand C 61, Olympia.**

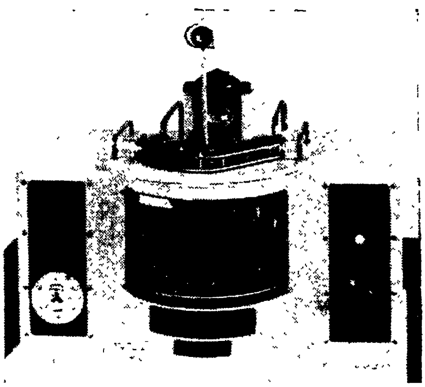
THE research and development division of Baird & Tatlock (London), Ltd., has recently developed a number of new items of laboratory apparatus. One of these is the B.T.L. self-balancing photoelectric recording absorptiometer. This instrument, produced in collaboration with I.C.I., Ltd., and to which much of the development work is due, was required originally to detect small colour changes in a liquor used in a chemical process, and to provide a continuous quantitative indication of these changes on a recorder. With suitable colour filters the instrument may be calibrated to record the composition of any liquid absorption of which can be related to some some of chemical analysis or turbidity.



Baird and Tatlock self-balancing photoelectric absorptiometer

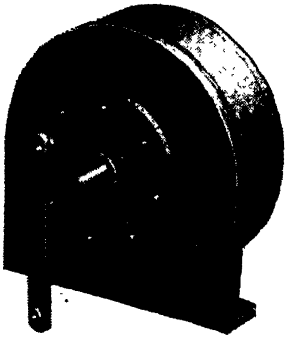
Another new instrument is the Preston density comparator, made exclusively for the British Hartford-Fairmont Syndicate. It is used as a comparator in the process control in glass manufacture. The method involves the settling of lumps of glass in a mixture of heavy liquids. This is done in a water bath by means of a constant rate of heating of the liquid. The temperatures are read at which the unknown and the known lumps pass a reference level in a tube of heavy liquid. The densities of the unknowns are then determined, from that of the known, by means of pre-determined coefficients.

Of particular interest to agricultural chemists and soil physicists is the development of the gypsum absorption cells for the determination of soil moisture content. These cells provide a response from which may be obtained a continuous measurement of soil moisture over the range which is critical to plant growth.—**BIF, Stand C57, Olympia.**



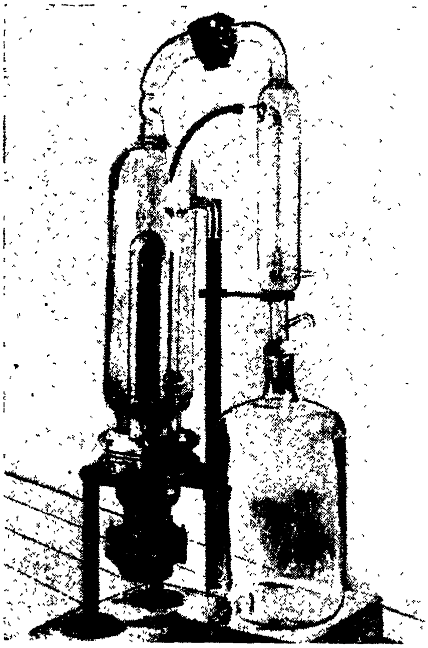
Preston density comparator by Baird and Tatlock

THE Unilag rotary time delay, by Unilag, Ltd., is claimed to be the only rotary type being produced and is stated to have opened up fields of use not possible with the ordinary rack and pinion operated type. Although primarily intended for use on electrical switchgear, etc., its application is not confined to electrical units, being suitable to any mechanism where a pre-determined delay, with or without a quick drop or free movement at the end, is required. All moving parts are load-tested on assembly and, being totally enclosed, are stated to give long and trouble-free service, unaffected by changes in climatic conditions. It is claimed to be an entirely new conception in time delays, designed to give continuous protection, control or regulation.



Unilag rotary time delay

ILLUSTRATING the numerous increasing uses of glass in laboratory apparatus and assemblies and chemical and other works equipment is a Pyrogen free distilled water unit by JAMES A. JOBLING & CO., LTD. This is constructed in Pyrex brand glass and is electrically heated by a glass immersion heater; it will yield some 3.5 litres per hour. Included in the large range of glassware produced by Jobling's is a spray cooler having over 200 ft. of 1-in. bore tubing, also a circulating evaporator which is capable of evaporating under full vacuum some 12-14 litres per hour.



Pyrogen free distilled water unit by Jas. A. Jobling and Co., Ltd.

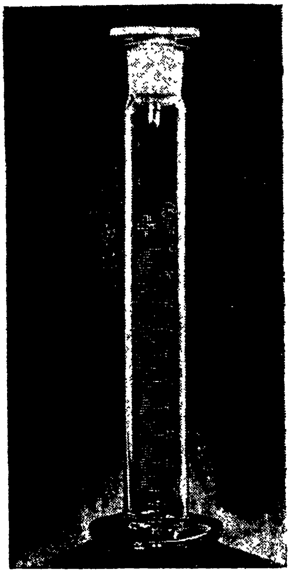
This firm specialises in the production of a complete range of Pyrex brand glass pipelines with precision bores, which are available in long lengths, also many improved patterns of ground glass joints to British Standards specifications.—**BIF, Stands S17 and S24, Earls Court.**

NOTEWORTHY among recent improvements in design and construction of laboratory glassware and apparatus are a number of products of H. J. ELLIOTT, LTD. These include thermometers employing a special type of gold-enamel-back glass tubing, which greatly facilitates readings made in indifferent conditions of lighting. This is produced by the contrast of the mercury column and black figuring and scale divisions with the yellow background.

Among the current productions of this firm are Nessler glasses for colour-comparison work. These are strictly to British Standard specification and are available in matched sets of ten. The base of each glass is shadowless, thus eliminating "dark spots" and distortion of transmitted light.

An item recently introduced by this firm is a glass measuring cylinder, with increased width of neck—making for faster pouring and easier cleaning after use —and patented "E-Mil" plastic stopper. A feature of Elliott glass apparatus is the exclusive chemically resistant coloured fillings in the gradations. Certain price reductions have recently been announced by this firm.

H. J. Elliott, Ltd., has recently evolved a new thermometer background in "gold" instead of the traditional white treatment. Against this background the mercury column shines with considerably increased brilliance and the definition of the graduations is clearer. The new thermometer can be read quickly even in uncertain light.—**BIF, Stand C.29, Olympia.**

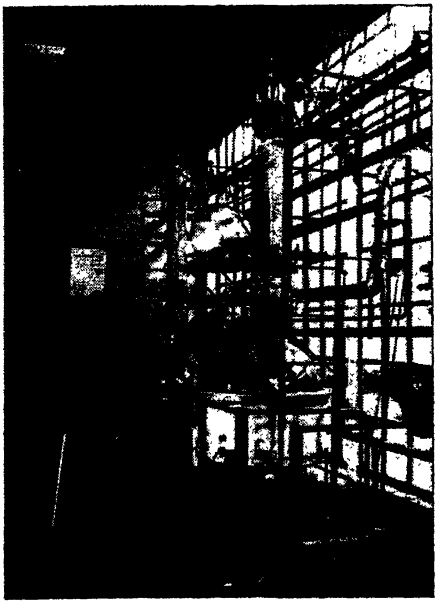


Measuring cylinder by H. J. Elliott, Ltd..

ONE of the largest operations in the production of optical instruments has recently been successfully completed by CHANCE BROTHERS, LTD. This is a large telescope disc for an American university. Made of dense flint optical glass, it is 25 in. in diameter and almost 4 in. at its thickest edge. It will be despatched to the U.S.A., where the surfaces will be ground and polished for use in the objective of a new Schmidt type telescope. The sequence of operations necessary for the production of this disc have occupied eight months. A special melting of glass of just the required composition to give the necessary refractive index had to be rendered homogeneous by stirring, being then cast into a large block weighing about half a ton.—**BIF, Stand C32, Olympia.**

A RECENTLY developed version of the standard AvoMeter of the AUTOMATIC COIL WINDER AND ELECTRICAL EQUIPMENT CO., LTD., has a sensitivity of 20,000 ohms per volt on the d.c. voltage ranges and 1000 ohms per volt on the a.c. ranges. The millivolt drop on d.c. current ranges does not exceed 500 mV. This is a compact and portable electrical measuring instrument for which many advantages are claimed which commend it for use in laboratory or workshop. A 5-in. clearly marked scale with an anti-parallax mirror is used for 25 ranges of readings.

THE microptic measuring machine (horizontal pattern) of HILGER & WATTS, LTD. (Watts Division), measures external and internal plane, cylindrical or threaded diameters direct to 0.00005 in. and by estimation to 0.00001 in. It has a range of measurement 0 to 4 in. and a capacity of 0 to 14 in. on external, and 7/16 to 10 in. on internal measurement. The measuring head is identical with that of the Watts vertical measuring machine, the accuracy of measurement being dependent on a precision-divided glass scale and not on mechanical parts. The bed is very sturdily constructed, and is provided with three levelling screws and a circular bubble. The measuring column is supported at both ends to eliminate risk of distortion. The work table is adjustable for height, and can be tilted and rotated. The instrument is supplied with a number of interchangeable measuring contacts for various classes of work, and specially designed work tables.—**BIF, Stands D319 and 216, Birmingham.**



A large-scale operation in glass by Quickfit and Quartz, Ltd. Reaction under reflex unit assembly in semi-technical laboratory with 100-litre capacity

The new series of precision scales made by Hilger & Watts, Ltd., is stated to rival the long used celluloid-edged boxwood scale and to be likely eventually to supersede it, since the price is lower. Each scale in the series is a carefully made reproduction of a precision-divided master scale, the dividing equipment used being the same as that used for lino standards, also produced by this company.—**BIF, SCIEX Stands Nos. C56, 57 and 58, Olympia.**

LABORATORY equipment currently made by GRIFFIN & TATLOCK, LTD., includes a number of new and interesting items. A concentric tube vacuum manometer represents a compact, easily refilled design for use in measuring gas pressures in the range 1-100 mm. of mercury. In the measurement of these sub-atmospheric pressures the manometer will appeal to those who have felt the need for a simple, robust, compact mercury-type instrument. The makers state that it will find immediate application in the chemical laboratory in organic distillations, in evacuation of desiccators and in the measurement of filtration processes.

New fractional distillation apparatus for laboratory use is being made by Griffin & Tatlock to the basic designs of the Anglo-Iranian Oil Co., Ltd. In designing these columns close attention has been paid not only to their theoretical performance and efficiency, but also to the ease of erecting them, of operating and of maintaining them. The glass parts are firmly supported, yet sufficiently flexibly mounted to ensure freedom from strain under thermal expansion. The boiling flask is easily accessible and interchangeable. Dixon gauze rings made by this firm are a new random packing for laboratory scale fractionating columns. Their high efficiency is stated to be achieved by using small gauze rings of Lessing shape and completely sealing the apertures of the gauze with the reflux liquid. A completely wetted surface is thus maintained throughout the fractionation, with an entire absence of visible channelling or drip.

THERE have been many developments, both in all-glass laboratory apparatus and in industrial plant in glass by **Quickfit & Quartz, Ltd.**, including new apparatus developed since last year's British Industries Fair.

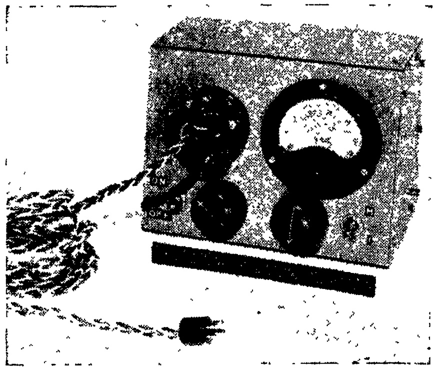
Laboratory glassware to be shown at the BIF and elsewhere shortly will include many assemblies, such as the Stadler still, reaction with stirring, steam distillation, vacuum fractionation, moisture determination, and chromatographic absorption. A new feature of interest is the "Utility" set, illustrating the versatile unit principles fundamental to the company's equipment.

Examples of industrial plant in glass stress the value of its non-corrosive properties and transparency. That is leading to its increasing employment for the production and absorption of acids, processing of rubber, manufacture of dyestuffs, rayon, concentrated and dehydrated foods and distillation in all its aspects, including valuable applications in the field of drug and fine chemical manufacture.

Exhibits which have been prepared for the BIF include a 100-litre combined reaction and distillation assembly, a typical continuous vacuum fractional distillation plant, reflux heads, packed column sections, a continuous vacuum receiver and several of the glass heat exchangers.

AMONG the many instruments and items of apparatus applicable to the chemical and related industries produced by the **General Electric Co., Ltd.**, is one of frequency stabilisation by molecular resonance. This apparatus provides a method by which the frequency of an oscillator may be stabilised. It depends on the fact that in some gases at low temperatures there is strong absorption of electromagnetic waves due to molecular resonance. Ammonia, for example, has been found to show strong absorptions for wavelengths in the region of 12 mm.

G.E.C. has produced a Geissler type of cold cathode discharge lamp in which the mercury isotope ^{198}Hg is used as the exciting element with an inert gas (neon or argon) as the carrier. The light emitted is of a very high monochromatic quality and the lamp can be used as a wavelength standard or for any application in which the absence of fine spectral structure is important. Four types of germanium crystal rectifiers for use in electronic circuits, indicating instruments, telephone apparatus, etc., have been introduced by The General Electric Co., Ltd., and are available for immediate delivery. The rectifiers are very small in size, have low forward impedance and are designed to be soldered directly into a circuit so that no mounting or support is needed. Their life should be not less than that of equipment in which they are used. **BIF, Stand C503 and 402, Birmingham.**



G.E.C. apparatus for the measurement of a magnetic field by means of the Hall effect in germanium. The germanium crystal is in the foreground

THE Foxboro Dynalog (Foxboro-Yoxall, Ltd.) presents an entirely new conception of the electrical bridge, self-balancing type of instrument. By advanced electrical methods such conventional mechanisms as slide wires, galvanometers, rotating balancing motors and standardisation checks, are eliminated.

In these instruments the measured electrical quantity (resistance, emf, *p*H, conductivity, etc.) is part of an a.c. bridge circuit and a detector circuit performs the functions of the conventional galvanometer. Electrical out-of-balance is amplified electronically, dispensing with the older galvanometer movement multiplication mechanisms.

Instead of a stepwise slide wire there is a smoothly operating Dynapoise drive, a solenoid motor, which serves to adjust a variable capacitor to restore electrical balance in the bridge. Up to six differently coloured records may be obtained upon a circular chart using a single pen arm. The marking frequency is one point in six seconds and continuous records can be obtained on a 24 hour chart. The Dynalog can be used for multi-point indication, using key pattern or rotary switches. and is also available as a primary measuring system for automatic control.

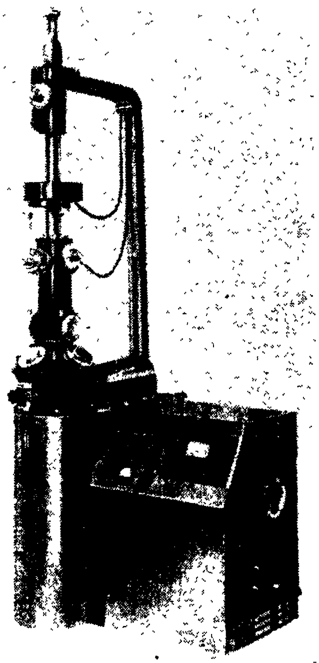
AN important means, in a newly available form, for widening the range of much laboratory work is represented by the Finch-type electron diffraction camera. This seems likely to gain wide acceptance as a powerful research tool for the investigation of surface phenomena, for example, the structure of thin films, surface layers of materials, metallic oxides and compounds, corrosion, plating, lubrication, metal-to-rubber bonding, etc.

The instrument illustrated is by W. Edwards & Co. (London), Ltd., which acknowledges its direct connection with the successful research work of Prof. G. I. Finch, augmented by development work in the firm's own research department. It is claimed that it combines scientific accuracy and dependability with the ready accessibility of controls expected by the practical operator.

The makers point out that much depends on the design of the source of electrons; in this instrument the cold cathode discharge is used with the Finch-type high tension circuit to give reliability with stability and robustness. Under operating conditions, *i.e.*, with accelerating voltages between 30 and 70 kV, quite a simple circuit is stated to suffice to maintain stabilisation, in order to obtain a monochromatic electron beam, and a high standard of definition.

With the aid of the split-plate shutter of this camera, the specimen under investigation can be photographically recorded side by side with a standard substance of known diffraction pattern, for subsequent comparison of the two records. This, it is pointed out, avoids the need for absolute measurement, as it gives an accuracy equal to that of X-ray diffraction.

High vacuum equipment by W. Edwards & Co. (London), Ltd., for the chemical and other fields, includes a range of rotary vacuum pumps. To provide suitable backing pumps for the larger diffusion units, the Speedivac range of mechanical pumps has been extended by the single stage model 1S450A having a displacement of 15 cu. ft./min. (450 litres/min.) and ultimate vacuum of 0.005 mm. Hg.



Electron diffraction camera by W. Edwards and Co. (London), Ltd.

(McLeod gauge). Its features include an integral spray arrester, oil level indicator, easy drainage facility, small oil supply, quiet valve, and light alloy construction.

This firm's range of oil diffusion pumps now includes a 16 in. diameter four-stage unit having a speed of 5000 to 6000 litres per sec. This, like all the pumps in the range beyond 1-in. size, incorporates an integral booster stage to reduce the size of the backing pump and associated pipelines. A self-purifying metal pump by W. Edwards & Co. (London), Ltd., operates with an interesting new fractionating arrangement and is capable of attaining ultimate pressure of the order of 10^{-7} mm. Hg. The pump is 2¼ in. bore, has a speed of 70-80 litres per sec. and a maximum backing pressure of 0.5 mm. Hg.—**BIF, SCIEX Stands Nos. 56, 57 and 58, Olympia.**

THE Cintel industrial electronic metal detector, made by Cinema-Television, Ltd., is an automatic inspection equipment for the detection of metal inclusions in many industrial productions, including plastics, chemicals, toilet preparations, rubber, etc. One of its advantages is stated to be that it gives protection to processing machinery. The equipment is sensitive to ferrous and non-ferrous metals, and alloys and will detect minute pieces. Use of automatic stabilising circuits assures maximum operating stability and is claimed to remove the need for skilled operating personnel. Operating costs are low, the power consumption being only 60 watts.—**BIF, Stand C49, Olympia.**

LONDEX, LTD., is manufacturing numerous items of automatic electrical control apparatus, including relays, and remote controls having applications in chemical and related industries. Among these is the Londex remote flow indicator, the applications of which include the control of tank overflows, distant water and oil supplies, and cooling water to plant. Another interesting piece of apparatus by this firm is the Lectralevel floatless liquid level control system.—**BIF, Stand C724, Birmingham.**

THE specialities of BARLOW-WHITNEY, LTD., cover a wide range of electrically heated plant and apparatus for industrial processes in many trades, vacuum and pressure impregnating plants, industrial ovens (for drying, stoving, curing, etc.), a humidity test cabinet, hot oil circulators, and many other items of interest to chemical and allied industries. Recently developed by this firm are special electrically heated pots and tanks for plastic dip coating processes, which are now being widely adopted for the protection of machined parts, tools, etc.—**BIF, Stand C210, Birmingham.**

A COMPLETELY new range of Megger testers, known as the Series 4, has been introduced by EVERSHED & VIGNOLES, LTD. The new instruments are housed in black plastic cases, 7¾ by 5 by 5¾ in., and have spring terminals. They are light in weight, easily portable and entirely self-contained. Their scale ranges are moderate, and they incorporate in a small instrument certain features hitherto available only in larger and more costly models. The new series of instruments includes insulation, continuity, earth and earthometer testers.

The Series 4 insulation tester, which has a scale range up to 50 megohms for testing at pressures up to 500 V., incorporates a constant pressure generator ensuring steady readings when testing cables having electrostatic capacity or circuits fitted with suppressors, a refinement previously only available on more expensive instruments in aluminium cases. The new tester can be fitted with a switch to divide scale readings by 100, or alternatively to have a second scale for continuity readings of 0-100 or 0-10,000 ohms according to need. Other features also available at extra cost, include a live line detector to protect the instrument during continuity tests on live circuits, and a dial illuminating attachment.

The Megger earth and earthometer testers, Series 4, are twin range instruments having scales of 0-40 and 0-200 ohms, or if preferred, 0-100 and 0-500 ohms. The earth tester determines the resistance to earth of earth electrodes, and the earthometer tester, which has a live line detector and special switch, measures with safety the impedance of complete earthing circuits, including the resistance of the sub-station electrodes and those at the consumer's premises.

THE modern instruments produced by the BRITISH THOMSON-HOUSTON CO., LTD., include a small mass spectrometer vacuum leak detector. This has its own vacuum pumps and electrical equipment comprised in a trolley cabinet, and has been designed for use under industrial conditions. The spectrometer employs 180° magnetic focusing and is of the cold-cathode type, ensuring long life and eliminating the need for a refrigerated trap; a.c. mains and cooling water are the only supplies required. Leaks as small as 10^{-5} litre micron per sec. can be detected.

Various lamps designed to provide powerful sources of radiation of definite wavelengths for laboratory measurement purposes are produced by the B.T.H. Co., Ltd. Some of these applications require a constancy of lamp output of a high order.

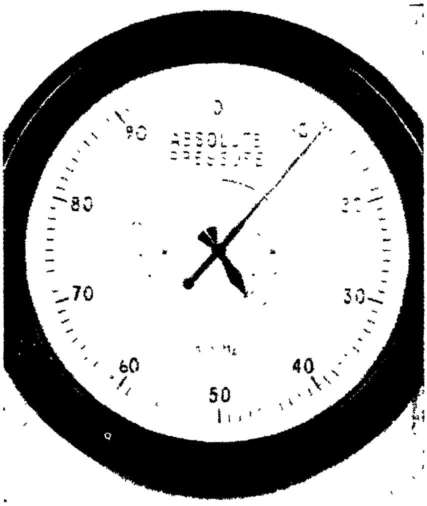
The BTH magnetic field strength meter employs the Hall effect in germanium. A small flake of germanium ⅛ in. by 1/16 in. by .015 in. thick is mounted in a probe, and thus can be used to explore and measure field strengths in very small gaps. The method is of greatest use where a certain orientation is known to be preferred; then the section to be examined can be chosen so that (100) planes are expected and inspection shows whether this is indeed the case.—**BIF, Stand C511 and 410, Birmingham; C106, Olympia.**

AMONG the recent laboratory equipment and instruments produced by the BALDWIN INSTRUMENT CO., LTD., is the Gamma radiation detector, Type PP. This is a compact, portable Geiger-Müller counter designed primarily for prospecting. It is also suited for finding lost radium in hospitals and laboratories and for demonstrating radioactivity in schools. A low voltage G-M tube and cold cathode valve amplifier are used to ensure long life of the dry batteries. An indicating instrument with approximately logarithmic calibration is also incorporated in the hermetically sealed case. A socket is provided for headphones to give audible signals at very low counting rate. The instrument is fully " tropicalised ".

A fountain-pen type pocket ionisation chamber, made by the Baldwin Instrument Co., Ltd., is for measuring the stray Gamma or X-radiation received by individuals exposed to such radiations, as in radio-therapy, diagnostic or industrial radiography departments and radiation laboratories. The chamber is hermetically sealed and desiccated to protect the insulator from dust and moisture. A diaphragm is provided for contacting the highly insulated centre electrode.

The Baldwin-Farmer protection electrometer is a compact valve electrometer for use in conjunction with the pocket ionisation chamber. Any number of chambers can be used with one instrument. Dry batteries used throughout have a useful life of several months even under continuous use.—**BIF, Stand C5, Olympia.**

A CONSIDERABLE widening of the field of usefulness of the normal moisture meter has been secured by MARCONI INSTRUMENTS, LTD., in their substantially modified TF933 model. This instrument is designed for application to granular, powdery and fibrous materials in the loose form or in thin sheets, at moisture contents within the hydroscopic range. On its release in 1949, calibrations were available for a limited number of substances, mostly cereal grains. To-day, however, the instrument can be successfully used on a much wider range, including such materials as dried seaweed and alginates, gelatin, glue and isinglass. Calibrations have been established for textile fibres and fabrics including cotton, jute, wool, fur and viscose and acetate rayons. Although manufactured chemicals and inorganic materials are not usually suitable, the instrument gives excellent results in the testing of welding rod coatings.



Kelvin and Hughes absolute pressure gauge

THE Kelvin absolute pressure gauge (the KELVIN & HUGHES group) is designed to measure the absolute pressure of a gas by admitting it into a flexible metal capsule whose deflection is determined by a suitable linkage and gear train. Compensation of variations in the ambient pressure is secured by introducing the movement of an evacuated capsule unit into the linkage system. To achieve this, the compensating capsule is carried on a fixed platform below the pressure sensing capsule, the latter carrying a lever, one end of which is pivoted to a rigid member from the centre of the compensating capsule, the other end being connected via a pivoted link to a crank arm carried on the input shaft of the gear train.

This instrument can be compensated to cover all normal variations in atmospheric pressure and over a temperature range of 50° C., say, 0° C. to + 50° C. Accuracy is stated to be better than 1 per cent of the scale range of 400 mm. Hg. chosen to be anywhere in the range 0-2 atmospheres. A two-pointer presentation is employed, the sensitive pointer making one revolution per 100 mm. Hg. change. The instrument may find application in chemical engineering plant as a vacuum gauge and in engine test-bed work as a boost gauge.

ELECTROLYTIC conductivity measurement has been recognised as an essential process in many industrial plants and in power stations and waterworks. In chemical factories, one of its applications is in the control of manufacture of sulphuric acid, ammonia and other products. In waterworks, the principle is applied to the detection of salt in water supplies from the upper reaches of tidal rivers. The " Multelec" electrolytic conductivity recorders of GEORGE KENT, LTD., with their potentiometric principle and null method of measurement, are stated to be capable of recording or controlling any condition which, by the use of a suitable primary element, can set up a small electromotive force or a change in electrical resistance proportional to the condition.

Besides electrolytic conductivity measurement, the main uses to which these instruments are put, and for which there are standard primary elements, are: temperature measurement and control, using thermocouples or resistance thermometers or radiation pyrometers, for all ranges up to 1800° C.; *p*H measurement and control, used in water purification in power stations for control of boiler feed treatment and in many chemical industries (open tank type and enclosed flow channel antimony-calomel electrodes and glass electrodes are used); CO_2 measurement for boiler houses and furnaces.

AMONG the many laboratory instruments and general scientific apparatus made by NEGRETTI & ZAMBRA its range of electrical temperature instruments is of current interest. Its Model E/650 is a 6-in. scale edgewise resistance thermometer indicator. This has an engraved scale and anti-parallax mirror, a die-cast aluminium case heavily enamelled black, with Bakelite bezel and with back plate or swivel bracket for projection mounting, or fitted with four studs for flush panel mounting. It is calibrated for nickel or platinum coil elements to any of the standard ranges. It is provided with test switch and standardising resistance, also two 2-volt 20 amp. hour accumulators.

Model E/600 by the same company is a 6-in. scale edgewise indicating pyrometer with automatic cold junction control, and has high resistance movement. It is calibrated for rare metal or base metal thermocouples to any of the standard ranges. The electrical resistance thermometer by this firm is suitable for temperatures between −200°C. and +540°C. (−330°F. and +1000°F.) and because a bridge circuit is used a range span of as little at 30°C. (50°F.) may be supplied with a 6-in. indicator.—**BIF, Stand D237, Birmingham.**

VITREOSIL apparatus by THE THERMAL SYNDICATE LTD., includes transparent specimen tubes for X-ray diffraction analysis; optical quality fused quartz prisms, lenses, discs, etc.; absorption cells for use in spectrophotometry. A further example of recent Vitreosil apparatus is the filtering and ignition crucibles. These are now used extensively in chemical laboratories as they enable both filtering and subsequent ignition to be carried out in the same crucible.

Single and two stage Vitreosil Umbrella jet pumps operate with backing pressure of about 1 mm Hg. and under such circumstances are capable of creating as low as 0.00002 mm. Hg. The necessary backing pressure can be satisfactorily attained by means of a Vitreosil mercury vapour fore pump operated from an ordinary water filter pump, which replaces the expensive mechanical type of backing pump. This arrangement of a single or two-stage umbrella jet pump used in conjunction with a fore pump is claimed to provide a very inexpensive and extremely efficient high vacuum system.

THE elimination of the vortices, which are practically inseparable from normal paddle stirred baths, by substituting a flat jet circulator head in the base of the instrument, thus giving straight line stirring, is one of the predominant features of the S.127 thermostat bath designed by TOWNSON AND MERCER, LTD. The bath, which has toughened plate glass sides, has a range of −10° C. (or lower) to 120° C. and provides accuracy of temperature control of ±0.03° C. at 50° C. or up to ±0.01° C. with electronic relay.

Another modern T. & M. instrument is the infra-red moisture tester which consists basically of a sensitive air damped balance with counter weight, and a single pan above the beam. This is enclosed in a separate aluminium walled chamber, and the weight is transmitted through a supporting rod via a narrow hole. Above the pan is positioned a powerful infra-red projection lamp. This has a specially shaped rhodium plated reflector which concentrates the beam on to the area of the pan, diffusing it so as to give an even coverage. The instrument weighs out a 5-gm. sample and indicates directly the moisture percentage.

The latest development by this company is the small compressed air turbine stirrer, Turbinia type 5, designed for pressures above 15 p.s.i. The air is led in down the hollow handle which also fits into any normal retort boss, so that the distance from the stand can be varied. The jet can be readily dismantled for cleaning. All the air has to escape from the annular ring round the chuck, so that no fumes can get into the rotor mechanism. The speed range is from 10-10,000 r.p.m.

Other up-to-date instruments by Townson and Mercer, Ltd., some of which the firm will be showing at the Canadian International Trade Fair, Toronto, include the Research model constant temperature bath, incorporating many new features; two new types of Even ovens which have a normal range from room temperature to 250° C. with specially open scale up to 110° C., and a special range from room temperature to 50° C. with very open scale —for use as anhydric incubator; a top drive macerater and the L.T. blowpipe, with five jets.—**BIF, Stand C4, Olympia.**

DESIGNED primarily for laboratory use and for the maximum utility, rectangular muffle furnaces, type M254, by **Wild-Barfield Electric Furnaces, Ltd.**, are effective for such work as incineration, burning off precipitate and the heat-treatment of small samples of metals and small tools. The maximum recommended temperature is 1000° C. (1832° F.), or for models fitted with an excess temperature cut-out 940° C. (1726° F.). Each is a self-contained unit having a counterbalanced door and refractory of the highest grade, and is being fitted with a built-in energy regulator for temperature control.

The Wild-Barfield laboratory tube muffles, type M94, are designed for analytical works laboratory applications, their uniformity of temperature and ease of control considerably simplifying operation and obviating errors which otherwise are liable to give incorrect results, the makers state. Coiled heating elements of heavy gauge nickel chromium alloy are employed to give a maximum temperature of 1050°C. (1922° F.). A hand-operated energy regulator type temperature controller is carried in the base, with requisite pilot lights. It is suitable for operation on 200/250 V. single phase a.c., or, with special equipment, on other a.c. supplies or d.c.—**BIF, Stand C321 and 220, Birmingham.**

ELECTRONIC valves and components increasingly employed in automatic operation control are receiving marked attention among the new products of **Mullard Electronic Products, Ltd.** These include general-purpose valves on Octal, B.8A and B.7G bases; battery and mains sub-miniatures; VHF valves; industrial thyratrons; industrial photocells; stabilisers and voltage reference tubes; electrometers; instrument cathode ray tubes; and electronic flash tubes.

The range of photocells, in particular, has been specially developed to meet the needs of industry and research. . Their wide field of applications includes counting and batching; sorting by various standards, such as size and colour; quality control; and the rapid and accurate inspection of mass-produced articles.

The thyratrons have a number of industrial applications, particularly in counting, timing, alarm and motor speed control systems.

Electrometer valves play an important part in high-resistance apparatus used in research, besides forming the basis of a variety of *p*H meters and valve voltmeters.

An important application of electronic flash tubes is the linear form used in the field of pure research for photographing ion-tracks in Wilson cloud chambers.

A new design of oscilloscope has been produced by Mullard, intended for a wide field of use, particularly in connection with nuclear research and television development. The instrument is built round a cathode ray tube with a useful screen diameter of 18 cm. and a blue-white trace suitable for visual or photographic work.

To help bridge the gap between fundamental discoveries in ultrasonics and their industrial exploitation was designed the Mullard ultrasonic generator. Methods available for generating ultrasonic vibrations depend on the medium which is to be irradiated. For liquids and solids only two methods are commonly employed, although alternative systems are being explored. These involve the use of magnetostrictive metals (which change their length in a magnetic field) and piezo-electric crystals (acted on by an electric field).—**BIF, Stand C69, Olympia.**

AMONG the wide range of chemical stoneware produced by **Doulton & Co., Ltd.**, are numerous small items as well as storage vessels and tanks of several hundred gal. capacity. In certain types of plant, such as vacuum filters, pumps, absorption towers and pipe lines, the fired ware can be machined to obtain high dimensional accuracy and close-fitting faces and joints. Special bodies have been evolved to suit specific requirements, *e.g.*, stoneware with very low porosity or with very marked resistance to abrasion, heat and thermal-shock.

It is claimed that there is no material available for chemical plant construction that has such a high and universal chemical resistance as chemical stoneware. Only hydrofluoric acid (or certain volatile fluorine compounds) and caustic alkalis have been found to have any detrimental effects. With this high resistance to corrosion. the material combines strength, rigidity, chemical inertness, and resistance to abrasive slurries. Chemical stoneware is extensively used in the manufacture of a wide range of chemicals, explosives, pharmaceuticals, drugs, paint, paper, light alloys, textiles, dyestuffs, precious metals, plastics, soap, rubber, foodstuffs, beverages and numerous other products.

The Doulton range of laboratory and technical porcelain includes a wide range of evaporating basins, crucibles, beakers, funnels, mortars and pestles and such special items as mercury troughs, staining troughs, cover rings, filter discs, depression tiles, combustion boats, bunsen burners, and anaerobic boxes, and a selection of miniature apparatus for use in micro-analysis.—**BIF, Stand D.743/642, Birmingham.**

STANDARDISING THE *p*H SCALE

U.S. Proposal for Consistent Values

THE *p*H unit to express numerically the degree of acidity or alkalinity of aqueous solution, may be defined in a number of ways, each resulting in a slightly different value for the *p*H of a given solution. Consequently, several *p*H scales, based upon various definitions, have met with equal favour among chemists.

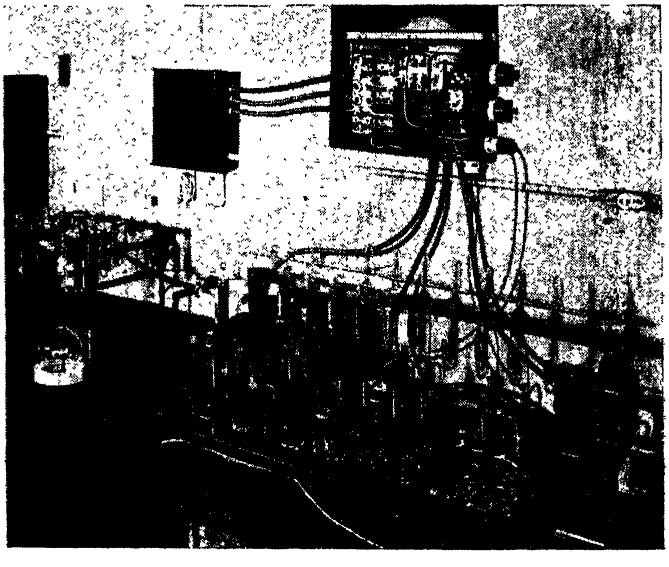
In view of the increasing need in science and industry for accurate determinations of acidity, the U.S. National Bureau of Standards is recommending the universal adoption of a single standard *p*H scale, analogous to the International Temperature Scale. It is proposed that the measure should be the *p*H assigned to solutions of buffer substances distributed by the Bureau of Standards and that the samples be taken as the fixed points in this standard scale.

In the preparation of many commercial products—for example, paper, textiles, dyes, ceramics, and beer—the rapidity and efficiency of the processes depend upon accurate control of the acidity or alkalinity of aqueous solutions. Such control is now a regular requirement in the preparation of certain medicines and in the manufacture of paper and leather.

In sugar manufacture, the inversion of sucrose can be regulated at will or avoided entirely by holding the acidity within certain limits. Similarly, regulation of the acidity of electroplating solutions permits the character of the deposit to be controlled. Another application of particular importance is the avoidance of corrosion and embrittlement of boiler walls and tubes by regulation of the acidity of boiler water. The widespread losses due to underground corrosion are likewise effectively curbed in many cases by proper adjustment of acidity.

The several convenient *p*H meters now available commercially enable precise determinations of *p*H values in such varied media to be made with ease and rapidity, but these values are based upon a scale fixed by the *p*H assigned to the standards with which the instrument has been calibrated. The differences among scales of *p*H are the direct result of different procedures, definitions, and assumptions employed in arriving at the *p*H of the standard.

The *p*H may be defined in one instance as the negative logarithm of the hydrogen-ion concentration; or, again, of the effective concentration or " activity " of



The source of the U.S. National Bureau of Standards' electromotive force data associated with pH values. The standard solutions are contained in the special cells, with hydrogen and silver-silver chloride electrodes, in a constant - temperature bath. A potentiometer measures electromotive force this ion. Sometimes the *p*H value defined by Sorensen in terms of the electromotive force of a galvanic cell with hydrogen and calomel electrodes chosen.

Although the differences among these scales rarely exceed 0.1 unit, the need for greater accuracy makes desirable the general adoption of a single series of consistent *p*H standards.

In its present attempt to procure uniformity in *p*H measurements, the U.S. National Bureau of Standards is now supplying four buffer substances in the form of standard samples of certified purity. These substances are acid potassium phthalate, potassium dihydrogen phosphate and di-sodium hydrogen phosphate (intended to be used together), and borax. They are being distributed at the rate of several hundred samples annually. The certificates furnished with these compounds specify the *p*H of certain aqueous solutions of the sample, which can provide fixed points on a *p*H scale.

In order to assign exact values to these fixed points, it was necessary to set up a scale based upon some suitable definition of *p*H. A consideration of the advantages and limitations of several scales led to a choice of a modified activity scale as most convenient and practical for general use. Although the activity of a single ionic species can be simply defined only in very dilute solutions, the influence of the hydrogen-ion activity in chemical equilibria is of far-reaching importance.

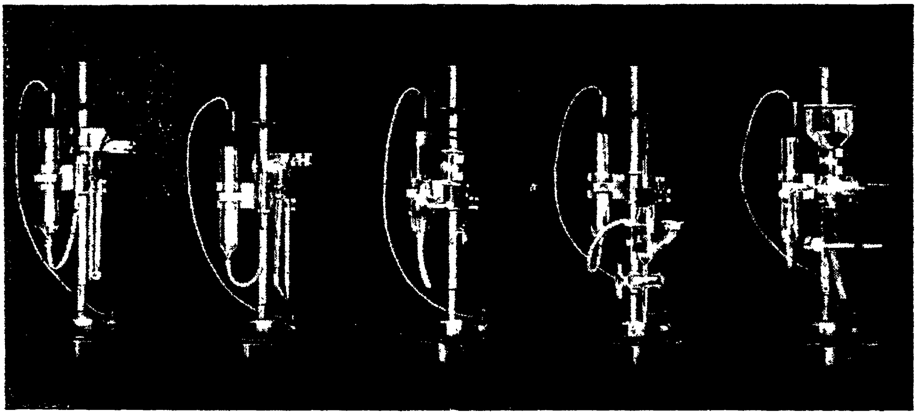
The *p*H of the U.S. National Bureau of Standards standard is derived from measurement of the electromotive force of cells without liquid junction, in which they are used as electrolytes. These cells are specially designed, utilising the highly reproducible hydrogen and silver-silver chloride electrodes.

Computation of *p*H is based upon several reasonable assumed relationship between ionic activities and mean activities. These assumptions are found to give identical values for dilute solutions. The scale thus obtained approaches a true scale of activity for solutions of low concentration; at higher ionic strengths it is best regarded as a consistent scale which necessarily rests upon an assumption not subject to experimental proof.

New Designs for pH Measurement

THE electrodes designed for use with the range of *p*H meters by MUIRHEAD & Co., LTD., are stated to possess many original features. In particular, the construction of the stand and mounting tube is based on sound principles of geometric design. It combines lightness with rigidity, and is capable of carrying any of the regulation electrode assemblies. Only 18 separate items make up the entire range, and from these the electrode assemblies can be constructed. Several items are common to two or more assemblies, so that the cost of widening the field of application of Muirhead *p*H meters is not great.

The electrodes supplied with types D-303-C, D-417-A and D-449-A comprise a dip-type glass electrode containing a silver/silver-chloride half-cell and a calomel half-cell carried in a reservoir of

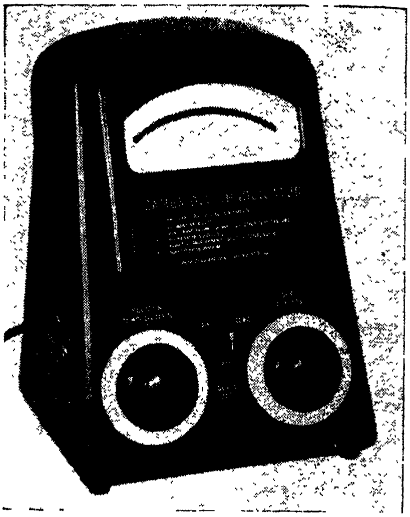


Five representatives of Muirhead electrode assemblies potassium chloride solution. The reservoir is connected to the solution under test through a tube of plastic material containing a partial obstruction and a glass tube terminating in a capillary, which is held close to the glass electrode by a stand. Assemblies are supported on the stand by means of clips attached to the mounting tube; in certain cases, additional clips are provided. The component parts are available separately to meet the requirements of customers who are already in possession of some of them and do not wish to duplicate their equipment.

Other new instruments and laboratory equipment by Muirhead & Co., Ltd., include a universal unit conductivity bridge, and a miniature Weston standard cell. An important advantage of the type of construction used in the latter is stated to be that virtually no temperature difference is possible between the mercury and cadmium amalgam half-cells. As the temperature coefficients of these are both relatively large, and opposite in sign, the risk of large changes in e.m.f. due to uneven temperature variation is largely eliminated.

COMPACT instruments for the determina- of *p*H have been available for several years, and the potentiometric type made by the CAMBRIDGE INSTRUMENT CO., LTD., are prominent among these. The new Cambridge direct reading *p*H indicator has been designed to meet the demand for a method of *p*H measurement comparable in simplicity and ease of reading with the instruments for long available, for example, for the measurement of temperature. This instrument is exceptionally simple in operation, and is claimed to be so stable that in ordinary circumstances the indicator need only be standardised against a buffer solution once a day. It may then be left in the hands of less experienced technicians for routine readings, thus rendering it an ideal instrument for works or laboratory use in the large number of applications where very high accuracy of reading is not required.

The instrument incorporates an open-scale pointer galvanometer of great reliability. The *p*H is read directly on the 120 mm. scale, covering the whole *p*H range of 0 to 14. with sub-divisions to 0.1 *p*H. Readings can be easily taken to 0.05 *p*H or less. Temperature compensation for the electrode system is provided by rotating a dial at the front of the instrument, the range covered being from 10° to 100°C. while the method of standardising the instrument against the buffer solution is also very simple.



The Cambridge direct-reading p*H indicator*

Metal Workers' Equipment

A NEW bench type micro-hardness tester, developed by the Guest, Keen & Nettlefold laboratories, has been produced by HALL TELEPHONE ACCESSORIES, LTD. This instrument is supplied with a bench type metallurgical microscope having a screw micrometer eyepiece and is suitable for performing identation or scratch tests using a 136° angle diamond pyramid indenter. It consists of a turret head with positive indexing, carrying a pivoted beam and two centralising objective adaptors. The beam pivot consists of two light leaf springs set at right angles to each other. This arrangement is claimed to make the beam stiff to horizontal and vertical deflections but relatively free to rotate, and provides a frictionless bearing.

CLAIMED to be an important addition to the present range of light welding equipment, a new transformer, type 1368, has been developed by Philips Electrical, Ltd. It is compact, portable and is suitable for use in all types of maintenance welding and on production lines in sheet and heavy metal-working shops.

The welding current control is continuous over the range of 70-350 amps, and the two current ranges available are: (low range) 70-170 amps (high range 170-350 amps. The transformer can be connected to any of six mains voltages between 190 and 500 volts. The connection value at the maximum load of 350 amps is 24.5 kVA.

Uniform Heating of Liquids to 350° C.

Comparative Data of Small-Scale Systems

By H. REIK, M.Sc.(Eng.), A.M.I.E.E., A.M.I.Mech.E.

NEARLY all chemical processes require the application of heat at one stage. This article is mainly concerned with the efficiencies and some other factors of methods adapted for use in small and medium scale production.

New heating methods have been developed during the last few years and it is likely that the plant and development chemist will be able to use the following notes as a general guide to the type of heating he can apply to his own plant when concerned with the application of temperatures between 100° and 400° C. (212° and 750°F.). Three methods mainly are used: direct firing: jacketing (indirect surface heating) and direct surface heating.

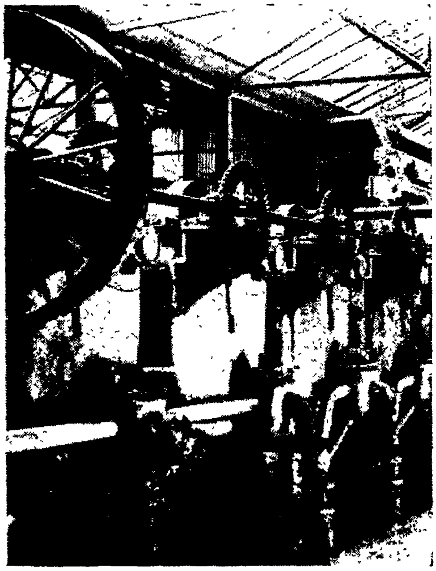
Direct Firing

1. Gas burners are the heaters most commonly used for direct firing. The method has a low primary cost. The air used is often preheated by simple heat exchange, but is low. Temperatures up to 350°C. can be reached, but the risk of excessive temperatures is always present if the level of the liquid drops. Direct contact with the flame may induce local overheating and distortion of containers. The temperature gradient between flame or gases and liquid is always high.

2. It is standard practice to jacket vessels like pressure autoclaves, reaction kettles and the like, thus allowing a heating medium to be applied to a large surface. The medium used can be either in the liquid or vapour phase, either type giving nearly uniform surface temperatures. The liquid temperature (save in the case of exothermic processes) is limited to that of the heating medium and local overheating is nearly always avoided, because of the comparatively small temperature gradient between medium and liquid at normal rates of heat transfer.

3. *Liquid Phase*: A fairly common form of heating medium in the liquid phase is circulating hot oil. A mineral oil, which must be free from unsaturated hydrocarbons and low volatile constituents, is used. It must have a high flashpoint and should not carbonise at high temperatures.

Oil itself is a poor conductor of heat and care must be taken that no overheating and carbonisation occurs in heating. This can be secured by maintaining a high rate of flow over the oil heaters by the use of circulating pumps designed to withstand the high temperatures involved. The oil heaters or absorbers consist either of circular tubes for smaller units (up to 200,000 BThU per hour) or straight tube to 5 million BThU per hour. The heat source for the smaller is gas or oil, and coal, coke or fuel oil for the larger units.



[By courtesy of General Engineering Co. (Radcliffe), Ltd.

Fig. 1. Jacketed bituminous mixers with jacketed pipes and cocks, all heated by oil circulation

The maximum temperature range of this type is 288° C. (550° F.). The overall heat transfer for forced oil circulation of this type from heating medium to liquid is between 25 and 50 BThU hr./sq. ft./°F.) It is therefore advisable not to exceed 260° C. (500° F.) in the vessel if reasonably fast distillation rates are desired.

Electric immersion heaters are often fitted inside an oil jacket for smaller installations. As such heaters often rely on convection currents, passages must be kept clear; slow circulation might cause local overheating of the immersion heaters and cracking and carbonisation of the oil.

Heating and cooling of the oil will be comparatively slow as fairly large volumes are usually employed.

Organic Silicates

Organic silicates have recently been introduced for liquid phase heating. They will work satisfactorily at temperatures up to 316°C. without deterioration.

A typical silicic acid ester used is tetra aryl silicate (TAS). This is a mixture of several phenyl-cresyl orthosilicates which will have a long working life at temperatures up to 316° C. (600° F.). Its properties are shown in Tables I and II.

TABLE I.—TETRA ARYL SILICATE

Composition : Organic silicate.
Solubility and compatibility with other liquids (at room temperature) : Water—insoluble, hydrolises slowly.
  Alcohols—soluble, slow alcholysis.
  Hydrocarbons—partly soluble in aliphatics.
  Chlorinates solvents—soluble.
Dielectric strength : Fair resistance.
Acidity : None.
Colour : Amber.
Odour : Slight phenol.
Hazards : None ; non-corrosive, non-toxic, non-explosive and offers little fire hazard.
Handling precautions : Protect against moisture, open flame and prolonged skin contact.

The tables show that TAS can be used as a heating and cooling liquid. Its control and heating is very similar to that of hot oil circulation.

Fig. 2 shows flow and return pipe connections in a recently installed plant (developed by Mactaggart and Evans at Leda Chemicals, Ltd., in conjunction with Hygrotherm Engineering, Ltd.).

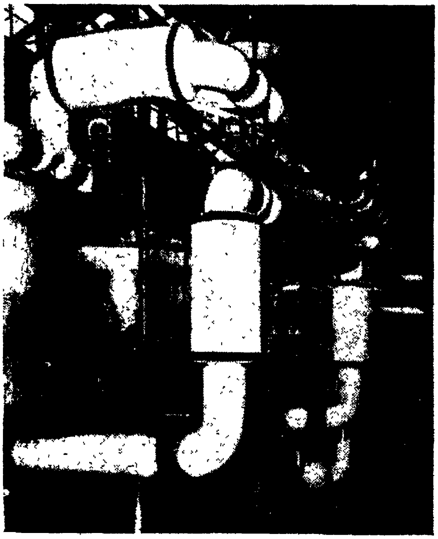


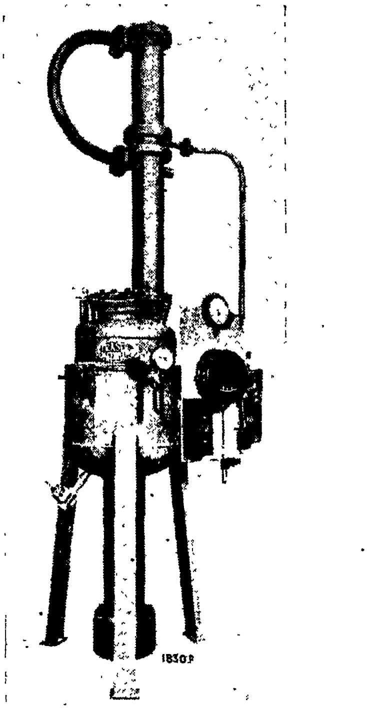
Fig. 2

Higher temperature liquids are in the development stage and it is probable that temperatures of up to 375° C. (700° F.) will be reached in the not too distant future.

Vapour Phase Saturated Steam

Large works often have available appreciable quantities of by-pass steam at about 50 p.s.i. Such saturated steam will condense on the heating surfaces of the jacketed vessels giving up its latent heat. These condensing vapour films give an extremely good heat transfer coefficient of up to 3000 BThU (hr./sq. ft./°F.), although it must be remembered that the overall heat transfer coefficient is only partly governed by that of the heating medium. A pressure of 50 p.s.i. will give good heating properties up to 130/140° C.

High-pressure saturated steam, often generated in standard tube boilers or elec-



[By courtesy of W. J. Fraser & Co., Ltd.

Fig. 3. Small vessel jacketed for Dowtherm heating and supplied with its own control panel

trode boilers, is used at temperatures up to 200° C., but it has the disadvantages associated with runs of high-pressure pipes, valves and joints.

Steam pressures above 400 p.s.i. will produce temperatures little higher than 230° C. These very high pressures are avoided by the use of an eutectic mixture of a diphenyl—diphenyl dioxide having a boiling point of about 258° C.

It can be seen that liquids can be heated to temperatures of about 350° C. at comparatively low vapour pressures. The great advantage of Dowtherm is its stability at these high temperatures. The working range is from 230° C. to 380° C. (vapour temperature). It is advisable not to exceed 380° C. and to avoid local overheating, as decomposition can then take place.

Ease of Control

Dowtherm A is not toxic in concentrations which could arise due to leaks. Because of its high wetting power it can, however, penetrate leaks which would ordinarily not be detected, making its presence apparent by a very unpleasant odour. Its own heat transfer coefficient is between 200 and 300 BThU (hr./sq. ft./°F.) when condensing. Being a saturated vapour, its temperature is determined by its pressure and can easily be controlled by a throttle valve within plus and minus 1¼° C.

Natural circulation boilers are used for pressures up to 60 p.s.i., while forced circulation should be employed for higher pressures. Water tube boilers up to 50 million BThU per hour capacity have been built in America.

Electric immersion heaters have been used for units up to 750.000 BThU per hour. A recent installation is at British Nylon Spinners, where both vessels and pipes are jacketed for Dowtherm vapours.

Superheated Steam

Superheated steam is often generated for high temperature heating because it allows lower pressures to be used. The advantage of condensing is lost, however, and heat transfers are of the order of only 2-5 BThU (hr./s. ft./°F.). This will therefore be useful to keep liquids at high temperatures or for slow rates of heat transfer. The method is not very efficient because of the comparatively high pipe losses, particularly if the steam has to be specially generated.

This is really a compromise between direct firing and jacketing. The heating surface is applied directly to the outer surface of the unjacketed vessel. It can be designed to have a uniform temperature or be given any desired heat gradient, often with the purpose of increasing convection currents in the liquid.

The method was developed in this country by the author in conjunction with Isopad, Ltd., for problems concerning glass plant where jacketing was not practicable.

The heater consists of electrical resistance wires which are interwoven with or attached to glass yarn cloth of the staple fibre type. The heating panel is shaped to surround the surface of the vessel to be heated. A lagging jacket is either in-

(*Text continued on page* 643)

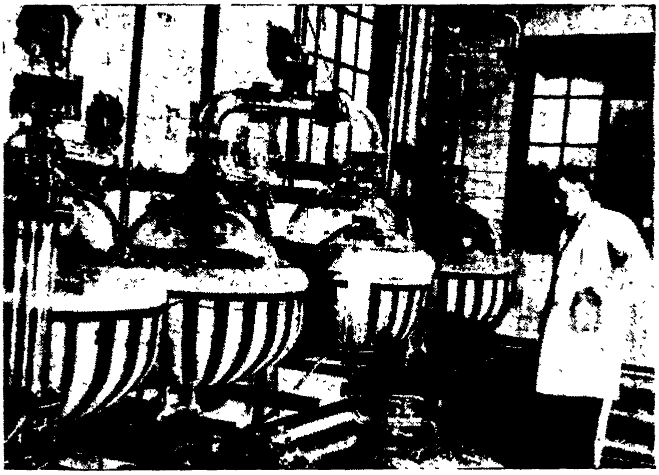


Fig. 4. Pilot plant heating in glass: a battery of 100-litre stills using Isomantles as the heat source

By courtesy of F. W. Berk & Co. Ltd., and Isopad Ltd.

TABLE II.—TETRA ARYL SILICATE: TABULATED PROPERTY DATA

Temperature °F.	Temperature °C. approx.	Viscosity Centipoises	Redwood Seconds*	Specific Gravity	Cubical Expansion per °F. × 10⁴	Cubical Expansion per °C. × 10⁴	Specific Heat	Vapour Pressure m.m. Hg
0	−18	740	260 (2)	1.182	3.98	7.16	0.36	—
50	10	52	190 (1)	1.158	4.07	7.33	0.37	—
100	38	14.2	60 (1)	1.135	4.15	7.47	0.39	—
150	66	6.4	circa 40 (1)	1.112	4.24	7.63	0.40	—
200	93	3.6	Less than 40 (1)	1.089	4.32	7.78	0.42	—
250	121	2.3		1.065	4.42	7.96	0.45	—
300	149	1.55		1.041	4.52	8.14	0.48	—
350	177	1.16		1.018	4.63	8.33	0.51	—
400	204	0.92		0.994	4.74	8.53	0.55	—
450	232	0.74		0.970	4.85	8.73	0.59	1.1
500	260	0.61		0.946	4.97	8.95	0.64	4.15
550	288	0.50		0.923	5.10	9.18	0.69	13.4
600	316	0.43		0.900	5.23	9.41	0.74	37.5
650	344	0.37		0.875	5.38	9.68	0.80	91.0
700	372	0.32		0.853	5.53	9.95	0.86	200.0
750	399	0.29		0.830	5.68	10.22	0.92	405.0
800	427	0.25		0.807	5.84	10.51	0.98	760.0

* Suffix (1) indicates Redwood No. 1. * Suffix (2) indicates Redwood No. 2.

TABLE III.—PROPERTIES OF SATURATED DOWTHERM VAPOURS

73.5% Diphenyl Oxide 26.5% Diphenyl

Temperature °F.	Temperature °C.	Pressure lb./sq. in. abs.	Pressure Vacuum in Hg.	Heat Content B.Th.U./lb. Liquid	Heat Content B.Th.U./lb. Latent	Heat Content B.Th.U./lb. Total	Specific Heat Liquid	Density lb./cu. ft. Liquid	Density lb./cu. ft. Vapour
53.6	12.0	—	—	0	164	164	0.37	—	—
60.0	15.6	—	—	2.4	163	165	0.38	—	—
70.0	21.1	—	—	6.2	162	168	0.38	—	—
80.0	26.7	—	—	10.1	161	171	0.39	—	—
90.0	32.2	—	—	14.0	160	174	0.39	—	—
100.0	37.8	—	—	18.0	158	176	0.40	—	—
120.0	48.9	—	—	26.0	157	183	0.40	—	—
140.0	60.0	—	—	34.2	155	189	0.41	—	—
160.0	71.1	—	—	42.6	154	197	0.42	—	—
180.0	82.2	—	—	51.2	152	203	0.43	63.1	—
200.0	93.3	—	—	60.0	150	210	0.44	62.5	0.0012
220.0	104.5	—	—	69.0	148	217	0.45	61.9	0.0020
240.0	115.0	0.18	29.63	78.2	146	224	0.46	61.4	0.0034
260.0	127.0	0.30	29.39	87.7	144	232	0.48	60.8	0.0056
280.0	137.0	0.48	29.023	97.5	143	240	0.49	60.1	0.0080
300.0	149.0	0.74	28.45	108.0	142	250	0.50	59.6	0.012
320.0	160.0	1.14	27.68	118.0	140	258	0.52	58.9	0.019
340.0	171.0	1.62	26.70	128.0	138	266	0.53	58.4	0.026
360.0	182.0	2.30	25.32	138.0	137	275	0.54	57.8	0.036
380.0	193.0	3.10	23.69	150.0	136	286	0.55	57.3	0.050
400.0	204.0	4.10	21.66	162.0	134	296	0.57	56.7	0.068
420.0	216.0	5.40	19.01	174.0	132	306	0.58	56.2	0.090
440.0	227.0	7.20	16.29	186.0	130	316	0.59	55.7	0.12
460.0	238.0	9.20	12.77	198.0	128	326	0.60	55.2	0.16
480.0	249.0	12.0	5.58	210.0	125	334	0.62	54.6	0.21
			p.s.i. gauge						
500.0	258.0	14.7	.0	222.0	123	345	0.63	54.1	0.28
520.0	271.0	20.4	5.7	234.0	120	354	0.64	53.2	0.30
540.0	282.0	25.1	10.4	247.0	118	365	0.65	52.7	0.44
560.0	293.0	30.8	16.1	260.0	115	375	0.65	51.9	0.54
580.0	304.0	36.6	21.9	274.0	112	386	0.66	51.2	0.67
600.0	315.0	44.3	29.6	288.0	110	398	0.66	50.4	0.88
620.0	327.0	53.0	35.4	302.0	107	409	0.67	49.8	1.10
640.0	338.0	63.6	48.9	316.0	105	421	0.67	49.1	1.24
660.0	349.0	74.2	59.5	330.0	102	432.	0.68	48.4	1.34
680.0	360.0	87.7	73.0	344.0	99	443	0.68	47.5	1.5
700.0	371.0	104.0	89.3	358.0	97	455	0.68	46.9	1.7
720.0	382.0	119.0	104.0	372.0	93	465	0.68	45.9	1.9
740.0	393.0	142.0	127.0	386.0	90	476	0.68	44.9	2.3

TABLE IV.—JACKETED VESSELS

Overall Coefficients U expressed in B.Th.U./hr. sq. ft./°F.

Fluid Inside Jacket	Fluid in Vessel	Wall Material	Agitation	U
Steam	Water	Enamelled C.I.	0–400 r.p.m.	96–120
Steam	Boiling SO_2	Steel		60
Steam	Water	Copper	None	148
Steam	Water	Copper	Stirring	244
Steam	Boiling water	Copper	None	250
Steam	Paraffin wax	Copper	None	27

(Table IV from A. P. Colburn, 1932-40, and McAdam-Heat Transmission.)

corporated into the heater or separately applied.

This lagging jacket also consists of glass cloth, having 2-3 in. thickness of glass wool lagging. The weight of small containers or pans is borne by the heaters, which in turn are supported by special stands. Containers over 60 gal. capacity have separate supports.

The lagging used permits efficiencies of the order of 90-95 per cent. It is usual to subdivide the heating area into horizontal segments, each of which consists of a separate circuit, which can be independently controlled.

The variable control enables the input into the upper circuits to be reduced if the level of the liquid drops.

The energy input is controlled either by on-off energy regulators, tapped transformers with tapping switches in the secondary, or simple on-off switches where fine control is not required and several circuits are available. The heaters are designed not to overheat under normal conditions.

Temperature control (which is not the same as energy control) is usually provided for higher powers at temperatures above 250° C. in order to reduce the influence of the human element. Such control can be either of the thermocouple-amplifier-power relay type or of the expanding liquid-power relay type. In either case, temperature can be controlled to very fine limits. Dual control can be employed with thermocouples both in the liquid to be heated and on the element.

The combination of energy and temperature control will allow processes to be run up to working temperature at a controlled BThU input, while temperature control limits the maximum temperature of the liquid.

While the element itself can be run up to 430° C. (805° F.), its use is limited to processes under 375° C., because a reasonable heat gradient is required between heater and liquid.

Heat Transfer

Actual heat transfer from the heating medium to the liquid is governed by the following main factors:—

(1) Heating medium and its phase;
(2) Type of liquid to be heated;
(3) State and temperature of liquid (whether agitated, etc.);
(4) Container material and surface condition.

Fig. 5 shows typical heat transfer curves for an enamelled cast-iron vessel which is assumed to be jacketed for the liquid and vapour phase processes, but without jacket for the application of direct surface heating.

The liquid is assumed to be an organic oil slightly agitated, while a heat transfer from the heating medium to the liquid o 1000 BThU/sq. ft./hr. is required.

It can be seen that both circulating hot oil (a) and TAS (b) show a considerable temperature drop between the heating medium and the outer surface of the vessel; there is hardly any drop across the cast iron, a small drop across the enamel and again a heavy drop across the stationary film separating the inner surface of the vessel from the slightly agitated liquid to be heated. This drop is governed by the amount of agitation provided, the viscosity of the liquid and its thermal conductivity.

Condensing vapours (225 p.s.i. steam (c); 50 p.s.i. Dowtherm (d); and 115 p.s.i. Dowtherm (e)) show their advantage, based on the fact that there is hardly any temperature drop between heating medium and inner surface, due to the latent heat of the liquid condensing on the surface of the vessel. The drop across the vessel and the film of the liquid to be heated is, of course, the same as before.

Superheated steam (f) gives a poor heat transfer, even under optimum conditions; while (g) shows that there will be two drops between an electric surface heater and the outer surface of the vessel; 1 between element and glass cloth; 2 between the glass cloth and outer surface.

Tables IV and V show some experimental results in tabulated form both for jacketed vessels and heat exchangers.

Comparison in Pilot Plants

The data presented here show that condensing vapours will give the best

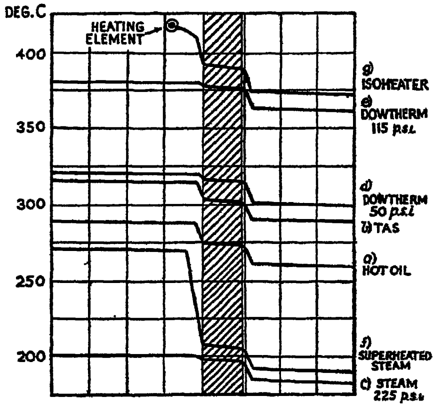


Fig. 5

possible rates of heat transfer. There is a gap between 180° C., where steam can still be used, and 250° C., where Dowtherm can be applied. This gap is conveniently filled by hot oil circulation heating and TAS heating. These have also merits of their own where users wish to avoid vapours under pressure.

The electric surface heater covers all temperature levels and has the advantage of simplicity in installation and comparatively low primary cost. It is, however, limited to maximum rates of heat transfer in the region of 2000 BThU/sq. ft. up to 200° C. and to 1200 BThU/sq. ft. above 300° C., unless automatic temperature control is employed.

Superheated steam will hardly ever be used for pilot plants. There is a tendency to use electric surface heaters of the Isomantle and Isojacket type for nearly all glass plant, although steam type boiler heat exchangers are preferred for temperatures below 120° C. where high rates of heat transfer are required.

It is rather difficult to compare running expenses per BThU transmitted, because of the many factors that have to be considered. Some of these are comparative rates per therm and kW-hour, cost of fuel, duty cycle involved, size of plant, etc.

Operating a small or medium-size plant requiring a working temperature of 200°C., high-pressure steam would give the best absolute efficiency, using an efficient boiler placed near to the jacketed vessels. This effect would be closely followed both by hot oil circulation and TAS, boiler heated.

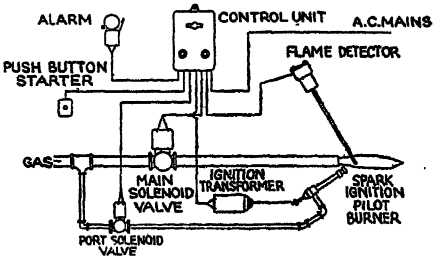
Electric heating, whether as direct surface heating or as immersion heaters for liquid heating, would have a high efficiency —up to 95 per cent. Against this, however, is set the comparatively high cost of the electrical unit due. Gas heating with efficiencies between 85 and 45 per cent is very similar in final running cost, but the relationship is determined by the local tariffs.

If the temperature of the plant required to be in the region of 300° C., Dowtherm would be most economical, if boiler heated; and the next in order of efficiency would be TAS (boiler heated).

For smaller plants, often using immersion heaters, Isoheaters would be slightly more efficient.

The above is offered merely as a very rough guide. Every problem calls for individual consideration on its merits and expert advice.

Safety Control of Non-Luminous Flames



THE protection of gas-fired installations against chances of explosions due to carelessness when lighting up, or to flame failure is now recognised to be of widespread importance. Certain types of flame, however, are not sufficiently luminous to affect the ordinary photoelectric cell used in modern flame control devices. That would be the case when burning methane, water gas, producer gas, etc., or when using non-luminous types of burners with ordinary coal gas. For such applications a London firm of photo-electric and electronic control engineers (Radiovisor Parent, Ltd., has introduced a special equipment. This is the Type FR. 49 Flamestat, which operates on principles entirely different from those employed in other models, although retaining the feature of instantaneous operation.

The equipment utilises the effect that flame serves as a partial conductor of electricity by instantly ionising the air in the immediate vicinity, thus making the air a conductor of electricity. A rod-type flame detector, electrically connected to the control unit, projects into the pilot flame, completing a circuit *via* the flame, to earth and closing a relay in the control unit which energises electrically-operated gas valves, holding them open. Immediately the flame fails, the circuit is broken and the valves close, shutting down the gas supply to the pilot light flame and burner. The unit may be connected to any type of electro-magnetic or motorised control valve. Being completely independent of thermal effects, the equipment is instantaneous in operation, and does not suffer from fatigue. It is unaffected by heat and is stated to be extremely sensitive and positive in action.

The control unit employs a single-stage thermionic valve amplifier within a small pressed steel housing (9 in. by 6 in. by

(*continued at foot of facing page*)

CHEMISTS' AND AIRCRAFT DEVELOPMENT

Exacting Requirements of Plastic Components

THE contribution of the chemist to aircraft development was the subject of a comprehensive review presented recently before the British Association of Chemists by Dr. T. B. Hughes (the Ministry of Supply).

The main function of the chemist in aircraft development, said Dr. Hughes, has been the continuous synthesis of new compounds and materials with improved properties. For structural purposes, the choice of materials is limited to those with (a) a high strength/weight ratio, (b) constancy of physical and chemical properties over a wide temperature range, and (c) resistance to weathering in climatic extremes.

Fuels and Plastics

The speaker limited the main part of his talk to two important contributions of chemists to aircraft development, viz., the production of high octane fuels for piston engines during the 1939-45 war, and the more recent studies on crazing of polymethyl methacrylate made at the Royal Aircraft Establishment and elsewhere.

The importance of octane number in determining the power output and fuel economy of supercharged aircraft engines was briefly outlined, and the contribution of fuel constituents in increasing the octane number explained. A survey was made of the rapid expansion of chemical cracking, polymerising, and alkylating plants for making iso-paraffins, especially isooctane, and it was emphasised that this achievement was made possible only by the continuous chemical research in the laboratories of oil companies in the pre-war years.

It was emphasised that the difficulties with the present material for aircraft windows and canopies, the polymer polymethyl methacrylate, were largely due to the higher speeds and pressurisation of modern civil and military aircraft. The material is subjected to higher stresses and its failure is now a serious hazard.

Solvent absorption and related studies with the polymer at the Royal Aircraft Establishment had shown that the surface failure or " crazing " was caused by the combined action of stress and solvents. The stresses could be " built-in " by the forming process and the solvent could be present initially as the monomer; such materials crazed readily.

Heat treatment processes for relaxing integral stresses and for completing polymerisation were summarised, and the importance of the Second Order Transition Temperature explained in relation to absorption processes and stress relaxation.

In service, the material is subject to a variety of stresses, which the designers are attempting to reduce to a minimum, while solvents may be picked up from gasoline vapours, cleaning materials etc. It is important that transparent components should be most carefully designed and maintained, and that the polymer should absorb the minimum of organic liquids or vapours brought into contact with it.

CONTROL OF NON-LUMINOUS FLAMES

4 in.). Green and red warning lights are incorporated to indicate normal running conditions or flame failure, and terminals are provided for connecting an external alarm bell. Mounted in the control unit is a robust relay connected externally to electro-magnetic or solenoid gas valves which are held open only when energised.

The flame detector carries the electrode rod, which is electrically connected to the control unit and projects into the pilot flame. The rod, mounted in a robust aluminium casting, is held in a threaded barrel which is welded or bolted to the boiler cover plate. The standard electrode rods are suitable for flame temperatures up to 850°C. and project 20 in. from the housing. Rods of any length and special types to withstand temperatures up to 2000°C. are, however, available.

The control equipment may be incorporated in circuit with thermostats, low water cut-outs, air flow swiches and similar control equipment, and there is a wide variety of ways in which the control unit may be connected to the gas valves. There is, for example, a manual ignition system in which the pilot gas is caused to flow by depressing a push-button starter. The pilot light is then ignited, completing a circuit to keep the starter button depressed. Release of pressure on the button automatically causes the main gas supply to flow, the circuit being so arranged that this cannot take place unless the pilot is alight. Should the flame fail, both gas valves immediately close.

SOUTH AFRICA'S CHROME RESERVES

Three Years' Steady Increase of Output

FIGURES for 1949 issued by the Union Department of Mines indicate that South African sales of chrome ore again reached a high total of 360,482 tons, valued at £1,015,741, compared with 347,379 tons, valued at £864,807, in 1948. In 1947 a total of 339,086 tons was sold.

The steady increase in the tonnage of chrome ore produced and sold indicates the extent of the demand for chrome that exists throughout the world, states *The South African Mining and Engineering Journal*, from which the following abstracts are taken.

The bulk of South Africa's chrome goes to the U.S.A. The 1949 details of exports have not yet been issued by the Department of Mines, but in 1948 the U.S.A. took 276,523 tons, the remainder of the sales tonnage being split between 13 other countries.

The ore exported is mainly friable and is best adapted for chemical use. In 1947, the last year for which complete figures are available, the Union supplied 83 per cent of the U.S.A.'s imports of chemical grade chrome ore.

The need for dollars has dictated more than ordinary attention to shipments of chrome ore. In point of fact, however, South Africa's production in each of the past three years has only just topped the output for the wartime peak attained in 1942.

Largest Deposit

In the Bushveld Igneous Complex of the Transvaal South Africa possesses what is probably the largest known reserve of chromite in a single geological formation. No other of comparable size is known.

According to estimates made by the Union Department of Mines, a conservative calculation of the available reserves of ores in South Africa is 200 million tons.

Transvaal ore is used mainly in the chemical industry and in the manufacture of chromic refractories. For the former the friable ore is generally preferred, the hard, lump ore going chiefly for refractory purposes. A considerable outlet for this ore lies in cements for patching and protecting furnaces, and also in making chromite bricks. Selected concentrated Transvaal ores are used to some extent in the manufacture of ferro-chrome both in the Union and overseas.

One of the difficulties experienced with many Transvaal chrome ores has been to find a technique which would produce a grade of concentrate sufficiently rich in chromic oxide to find a wide market. Experiments were carried out some years ago in the field by the operating companies, and the stage has now been reached where a satisfactory concentrate is being produced. In the interim, however, the companies concerned spent considerable sums trying to achieve a product which would meet the current demand.

While South Africa produces mostly chemical grade chrome ore, Southern Rhodesia is regarded as one of the world's most important sources of metallurgical grade ore. The ore has a high chrome oxide content and the estimated reserves are large.

The known grades of ore throughout the world are mainly of the refractory and chemical types, whereas the present world consumption is largely of the high chrome content type metallurgical ore. This suggests that the time may come when it will be necessary to use more of the ores with a high iron content, wherever they can be substituted for high chrome-bearing ores.

Chemical grade ores should be as high in Cr_2O_3 and as low in SiO_2 and Al_2O_3 as possible. Specifications are rather more variable and less rigid than in the case of metallurgical and refractory grades and are generally determined on a basis which takes into account availability and price. It follows that the price obtained for chemical grade ores is quite considerably lower than for the other grades.

Electro-Chemical Research in India

THE Indian section of the International Electro-Chemical Society, (founded in 1902 for the promotion of the study of electro-chemistry) has been inaugurated at Bangalore by Dr. B. K. Ram Prasad, of the Electricity Grid Department, Government of Bombay. Dr. Prasad said that the Government of India had proposed to form an Electro-Chemical Research Institute and hoped that the National Planning Committee set up by the Government of India would take note of the possibilities of development of these industries. It was suggested that the scrap copper available in Mysore could supply a flourishing industry.

PRODUCTION OF W. GERMAN CHEMICALS

Cautious Buying and Increased Import Competition

THE anticipated increase in output of the German chemical industry in the British zone in January did not take place and statistics indicate that the production level was about that of the previous quarter.

That information comes from the *Monthly Report of the Control Commission for Germany (British Element)* (5, No. 2, 48), which adds that production was limited more by market difficulties than by any shortage of capacity, raw materials or power.

The main difficulties were the generally limited purchasing power of users, the cautious purchasing policy adopted even where money was available, as, for example, the failure of farmers to take up normal supplies of fertilisers, and competition from imported materials, as in the paints and varnishes, soap and pharmaceutical industries.

Fertiliser Materials

The production of finished nitrogen fertilisers increased from approximately 34,700 tons in December to 40,200 tons in January. The production of synthetic ammonia, however, decreased by about 1000 tons. Storage difficulties showed no signs of diminishing.

An increase by over 2300 tons in the output of phosphate fertilisers was recorded, making 27,400 tons, in terms of phosphorus pentoxide (P_2O_5). The increases were in Rhenania phosphate and basic slag.

The production of superphosphate remained low; one factory closed down during the month owing to lack of storage space and some others worked at only 50 per cent capacity for the same reason. The position was affected by the cessation of deliveries to the Soviet Zone at the end of 1949, imports of superphosphates from processing contracts and the continuation of a poor internal sales position. Deliveries to the Eastern Zone were renewed on a reduced scale.

A rise of nearly 5000 tons during January to 73,000 tons of potassium oxide (K_2O) is reported. Burbach Kali Werke, which is reopening one of its mines near Göttingen, has made considerable progress and workings are now about 300 m. nearer the potash deposits than at the beginning of the year. This long term scheme, when completed, is expected to double the firm's present production.

Sulphuric acid production increased by 4000 tons to approximately 87,000 tons of sulphuric anhydride. A contract for the import of sulphuric acid from Belgium for nitrogen fixation was completed and another contract is being negotiated.

Owing to low demand, production of soda ash in the Federal Republic fell by over 5000 tons to 49,500 tons. Production of caustic soda remained about the same, but a large proportion was put into stock. The output of calcium carbide fell by about 3000 tons to 46,000 tons, partly due to repairs at Knapsack, and that of dyestuffs rose slightly to about 2000 tons.

The prospects for improvement in the production of synthetic resins and plastics were jeopardised by imports from neighbouring countries, under the recent liberalised trade policy. Manufacturers gave attention to export possibilities to compensate for loss of home trade.

Ample supplies of methanol were available. Large stocks accumulated in Land Niedersachen and, the Land Government ended distribution control. The demand for high class solvents and plasticisers continued to be good and there was considerable price competition internally and in world markets.

Coal tar distillation products, such as pitch, naphthalene, anthracene and pyridine, were fully utilised by the home market, but there was some excess of tar oils. There was severe competition in export markets and price-cutting resulted.

Three-fold Increase in Chemical Exports

CHEMICAL and allied exports from Western Germany during recent months have continued at the fairly high rate reached towards the end of last year. A falling-off in shipments of semi-finished products has been offset by larger consignments of paints and pharmaceuticals. exports of most groups of chemicals are now three times as large as in early 1949.

The first pre-war shipment of German rayon to the U.S.A. has arrived in New York and is reported to have been sold at a price 2 cents per lb. less than the U.S. domestic price.

Among recent trade agreements likely to result in an expansion of chemical exports from Western Germany is one with Spain, under which Germany is to receive chemicals, including pyrites, valued at $5.2 million during the 12 months beginning May 1 and to export to Spain chemicals, including fertilisers, valued at $13 million.

German chemicals also figure prominently in trade agreements with Ecuador and Iceland and there is still keen buying interest in German potash salts.

Conversion to Fertilisers

Gewerkschaft Victor, owner of the Fischer-Tropsch plant at Castrop-Rauxel, for which the interim production permit expired at the end of 1949, has now made arrangements to employ the plant's 900 workers in the production of chemical fertilisers. The financial requirements for conversion to the manufacture of fertilisers have been met with the help of the North Rhine-Westphalian Government. Gewerkschaft Victor is to receive loans totalling Dm.4.7 million, of which Dm.2.7 million will be paid by March, 1951, to cover expenses incurred in the first 12 months.

Rheinische Kunstseide AG, Krefeld, reports that the total war damage, estimated at Rm.20 million, has been made good. Further plant modernisation and re-training of workers have, it is claimed, strengthened the competitive strength of the enterprise in the world market. About 5-10 per cent of the rayon and staple fibre output of this leading producer is being sold abroad, chiefly to Scandinavia, South and Central America. The demand for staple fibre still exceeds the company's productive capacity.

The pharmaceutical factory of Schering AG in West Berlin has benefited from the increased interest shown in Berlin economic life by the Allied authorities and the Federal Government in Bonn. The factory is now in full operation, and employment for its 1700 workers is assured for a considerable time, largely as a result of several big export orders.

The company's export business now accounts for 25-30 per cent of all sales, compared with 60 per cent before the war. Its best foreign markets are India, Australia and the Middle East. Sales in Eastern Germany, which would normally provide the main market for Schering products from Berlin, are still at a standstill. A new building, estimated to cost Dm.1.2 million, is being built, with ERP aid, on the company's Berlin premises.

New Insecticide

Farbenfabriken Bayer, Leverkusen, intends to place on the market a new insecticide, for which high effectiveness against the Colorado beetle is claimed. Hitherto known as E 838, it will be marketed under the trade name Potasan and is expected to be available in substantial quantities by next spring. It is said to be equally effective against other insects and larvae. Tests at the Central Biological Institute, Brunswick, were reportedly successful.

Commercial Chemical Trends in France

THE production figures of French chemical industry in February show outputs of 97,286 tons of sulphuric acid (111,700 tons in January); 10,820 tons of hydrochloric acid (little change); 8000 tons of calcium carbide (11,000); 53,044 tons of sodium bicarbonate (61,110); 19,313 tons of caustic soda (20,736); 5500 tons of copper sulphate (4150).

Comparative figures for fertilisers are as follows: 110,000 tons of compound fertiliser (105,000); 98,000 tons of superphosphates (95,000); 19,200 tons of anhydrous ammonia (21,964); 16,800 tons of nitrogenous fertilisers (19,170); 6000 tons of powdered phosphates (4500).

The Établissments Kuhlmann is reorganising its factories to increase production, particularly of sulphuric acid. The new factories at Paimboeuf came into service last year. Study of a " flash roasting " plant at La Madeleine, part of a regional plan, has been completed.

On the expectation of the continued freeing of international trade, the French chemical industry is demanding fuller reciprocal measures, re-establishment of customs protection where free exchanges are still not available and revision of customs duties on the basis of home and foreign cost prices. The end of price limitation is also sought.

By the end of 1950, it is thought there will be few chemical materials whose entry will be restricted. The exceptions will be determined by consideration of the industry's modernisation plans, existence of over-production abroad, particularly in Germany, the high cost of power, and the national policy of encouraging agricultural production.

• PERSONAL •

DR. E. W. TITTERTON, of the Atomic Research Establishment, Harwell, has been appointed to a chair of physics at the Australian National University. The professor was a member of a team working on the development of micro-wave radar devices during the war, and later distinguished himself in the advancement of physical technique when visiting the U.S.A. as one of the British nuclear research team. He is expected to go to Australia at the end of this year, and will work with Professor M. L. Oliphant in the Research School of Physical Sciences.

The Honorary Fellowship of the Institute of Petroleum, its highest class of membership, was awarded to MR. JAMES KEWLEY at the recent annual general meeting. Mr. Kewley, who is 70, has had long associations both with the oil industry, as an employee of 34 years' standing with the Shell organisation, and with the Institute of Petroleum, of which he has been vice-president and president. He was the Shell company's chief chemist during the 21 years preceding his retirement in 1940, in which position he was responsible not only for technical guidance on refinery matters and to the marketing areas, but also for the engagement and training of the large number of chemists and chemical engineers.

Two young Glasgow science graduates, ALFRED P. C. CUMMING and JAMES A. HORN, have been awarded the 1949 Newton Chambers Prize of £100, for their studies in connection with the burning of acetylene flames, research which was started as a result of a fatal accident in a coal mine. The award was made by the committee of the Sheffield, South Yorkshire and North Midland sections of the Royal Institute of Chemistry.

MR. W. J. SANDERS has been appointed general sales manager of Reads, Ltd., Liverpool, and its associated companies. He was formerly sales manager of the Metal Box Co., South London branch. He succeeds MR. LEONARD DODD, who is remaining with Reads, Ltd., as general sales adviser.

MR. R. G. BERCHEM, (Jeyes' Sanitary Compounds Co., Ltd.) is the chairman for the current year of the British Disinfectant Manufacturers' Association. MR. A. E. BERRY was, at the same meeting, elected vice-chairman and MR. VICTOR G. GIBBS hon. treasurer.

AIR COMMODORE SIR FRANK WHITTLE has agreed to act as a consultant to Power Jets (Research and Development), Ltd., in all matters relating to gas turbine except in the field of civil aviation. The appointment has the approval of the Board of British Overseas Airways Corporation, for which he will continue to act as honorary technical adviser on jet development. Power Jets is responsible for holding and exploiting patents resulting from Government research and development in the gas turbine field.

A photograph of MR. DEREK SPENCE, managing director of Peter Spence & Sons, Ltd., presenting a copy of "The Earliest Chemical Industry" to DR. BENJAMIN T. BROOKS, chemical consultant and chairman of the library committee of The Chemists' Club, New York, appears in the club's March bulletin (Vol. 3, No. 6). The book, published to mark the centenary, in 1946, of Peter Spence & Sons, Ltd., (THE CHEMICAL AGE *60*, 699), is an outstanding example of fine printing and colour reproduction.

MR. WILLIAM B. BIBBY, chairman of J. Bibby and Sons, Ltd., cattle food and soap manufacturers, Liverpool, was presented with a television set from the directors and employees at a dinner on April 21, to mark his retirement. He had served the company since 1898. Mrs. Bibby received a gift of jewellery. Mr. Bibby's successor as chairman is MR. H. PERCY BIBBY.

MR. L. O. KEKWICK was unanimously re-elected as chairman for a second year of the London Section of the Oil and Colour Chemists' Association at last week's annual meeting. The other principal officers, including the hon. secretary, MR. H. C. WORSDALL, were re-elected to serve for the current year.

LORD MCGOWAN, chairman of Imperial Chemical Industries, Ltd., was among those on whom the honorary degree of LL.D. was conferred at St. Andrews University on April 20.

OBITUARY

The death is announced of MR. H. J. G. WATKIS, general sales manager of a subsidiary company of Reads, Ltd., Liverpool, which he joined in May 1949 after his retirement from I.C.I., Ltd., London, where he was a buyer in the central purchasing department.

SIR GEORGE BEILBY AWARDS

Advancement of Chemistry

THE administrators of the Sir George Beilby Memorial Fund, representing the Institute of Metals, the Royal Institute of Chemistry and the Society of Chemical Industry, have decided to make three awards, each of 100 guineas, for 1949. These awards have been made to:

F. R. N. Nabarro, M.B.E., M.A., B.Sc. (Oxon.), in recognition of his application of mathematical methods to the elucidation of the mechanical properties of metals.

Charles Eric Ransley, M.Sc., Ph.D. (Lond.), F.I.M., in recognition of his experimental contributions to knowledge of the behaviour of gases in metals.

Keble Watson Sykes, M.A., B.Sc., D.Phil. (Oxon.), in recognition of his experimental contributions to the study of the combustion of carbon and its oxidation by steam.

Mr. Nabarro, born in London in 1916, was in 1938 a senior scholar of New College, Oxford, and later worked in the University of Bristol under Professor N. F. Mott. He published work on the effect of internal strains on precipitation in alloys, and on a simple theory of precipitation hardening. He carried out a great variety of studies, during the war, for the War Office and afterwards returned to Bristol as a Royal Society Warren Research Fellow in 1945. Since then he has worked principally on the dislocation theory of slip in metals.

Mr. Nabarro is a lecturer in metallurgy in the University of Birmingham and a research Fellow in metallurgy.

Dr. Ransley, educated at Wembley County School, graduated in chemistry at the University of London as an external student in 1942.

As a member of the metallurgical staff of the G.E.C. laboratories he was engaged mainly on problems connected with tungsten, molybdenum, nickel and other materials used in the manufacture of lamps and thermionic valves. In 1945 he became associated with the research laboratories of The British Aluminium Company at Gerrards Cross, Bucks., where he is in charge of a group working mainly on problems arising in the casting and fabrication of aluminium and its alloys.

Dr. Sykes has been closely identified with chemistry at Oxford University, where he obtained a first class in the Final Honours School of natural science (chemistry) and a distinction in crystallography.

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In 1942 he began work on wartime problems in the physical chemistry laboratory at Oxford under the supervision of Prof. Sir Cyril Hinshelwood. He held a Queen's College Taberdarship from 1943 to 1945, and an Imperial Chemical Industries Fellowship from 1945 to 1948. This work soon led to a fundamental investigation of the kinetics of the reactions of the steam-carbon system, which was carried on with a series of collaborators.

In 1948 Dr. Sykes went to University College, Swansea, as a lecturer in chemistry. He is studying, among other subjects, the kinetics of the reaction of carbon with compounds containing sulphur. Part of this work is being supported by the Ministry of Supply.

THE MELDOLA MEDALLIST

Study of High Explosives

ON the recommendation of the Council of the Royal Institute of Chemistry, the Society of Maccabaeans is to present the Meldola Medal for 1949 to Dr. Andrew John Blackford Robertson, in recognition of his work, before he was 30, on explosives and on the application of the mass spectrometer to the study of chemical reactions.

After graduating at Cambridge Dr. Robertson entered the Department of Colloid Science in 1941 as a member of Professor E. K. Rideal's team working on explosives, and studied their sensitiveness to heat.

Many high explosives were found to decompose quite smoothly, though rapidly, at elevated temperatures, and the kinetic features were studied. The actual transition between thermal decomposition and spontaneous explosion of a number of high explosives was directly examined.

Dr. Robertson was awarded the Henry Humphries Prize by St. John's College for this work, and in 1946 elected to a Fellowship. He continued experimental work under Professor Rideal at the Royal Institution on the catalytic pyrolysis of hydrocarbons, using a simple mass spectrometer as an analytical tool and for the direct detection of free radicals.

In 1948 he was appointed a junior research Fellow by the managers of the Royal Institution, and in 1949 to a senior studentship by the Commissioners for the Exhibition of 1951.

He is at present developing his work on the direct study of free radical reactions in the Davy Faraday Research Laboratory of the Royal Institution.

HOME

Reduction of Hard Soap Prices

From April 23, the maximum retail price of all brands of hard soap has been reduced by one halfpenny a pound, by an amendment of the Soap (Maximum Retail Prices) Order, 1947.

Price Control Removed

The Board of Trade has made an order freeing perfumes and toilet preparations from price control as from May 1. The Board notes that the prices of many of these goods have recently been reduced and there are now ample supplies.

Chemical Duty Exemptions

The Treasury has made an order under Section 10(5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty for the period April 22-June 30, 1950: B. aminopropionic acid; ethyl sulphate (or ethyl ester); potassium guaiacolsulphonate; sodium fluosilicate; R. sorbitol; sorbitol, synthetic.

Wool Education Society

A new organisation to be known as the Wool Education Society has been set up by the International Wool Secretariat. It is to disseminate knowledge relating to wool and new developments in wool technology, publishing a quarterly journal *Wool Knowledge*. Meetings will be held, at first in London, but later in the Provinces.

Coal Production

Output of deep-mined coal in Britain last week rose by 1,205,100 tons to 4.161,100 tons. This compares with an average of 4,097,000 tons for the 18 full weeks before Easter and an average of 4,052,500 tons for the corresponding period last year. An increase of 83,300 tons in opencast output brought last week's total coal production to 4,420,700 tons. This was an increase of 1,288,400 tons over the previous week's total.

Higher Paper Prices

A general increase in the maximum prices of newsprint and most other types of paper and board took effect on April 24, associated with increases in the cost of imported woodpulp. The standard price of newsprint has been raised by £2 5s. per ton. Prices of other paper and board are increased by varying amounts according to the woodpulp content. Waste paper and other wast fibrous materials used in paper making will no longer be subject to price control or licensing.

£2 More for Lead

Following two reductions in price last month, the Ministry of Supply last week announced an increase in the U.K. cost of good soft pig lead by £2 a ton delivered, from £84 to £86 a ton.

Expanding Fish Oil Industry

Expansion of meal and oil reduction activity is proposed in Stornoway by the Herring Industry Board. It is planned to extend and modernise the plant to handle a much increased volume of herrings.

Prices of Refined Oils

The Minister of Food announces that no change will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period ending June 17.

U.K. Light Metal Statistics

Ministry of Supply statistics relating to U.K. production, imports and consumption of light metals in November include the following (in long tons): Virgin aluminium: production 2303, imports 5901. Secondary aluminium: production 6850. Aluminium scrap arisings 7220, consumption 10,218. Aluminium fabrication: 17,842. Magnesium fabrication: 317.

Metal Prices Rise

The price of good ordinary zinc was increased by £4 from £91 10s. to £95 10s. a ton delivered, as from April 20. Prices of other grades varied accordingly. The zinc oxide manufacturers announced that from the same date, the price of zinc oxide in lots of not less than two tons, delivered, was increased by £3 10s. New prices for zinc oxide were: Red seal, £91; Green seal, £92 10s.; White seal, £93 10s.

Education in Chemistry

"I am well aware of the importance of an adequate supply of university graduates trained in chemistry," said the Chancellor of the Exchequer, replying in the House to questions about the provision of better chemistry training facilities at schools and universities. "The number of students taking honours courses in that subject has doubled since the war, and new laboratories are under construction or planned for erection in the near future at a number of universities. I am satisfied that the claims of the scientific departments are receiving due consideration from those responsible," he said.

Technical Publications

"SYMPOSIUM on Particle Size Analysis" and "A Problem in Chemical Engineering Design: The Manufacture of Mononitrotoluene" are two new publications recently issued by the Institution of Chemical Engineers.

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" A CHEMIST looks at 1950 " and " Outlook for Linseed " are features of the fourth annual edition of " The Spectrum," now available from the Society of British Paint Manufacturers, Ltd. This year all the content matter is material which has not already appeared in the monthly issues.

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RECONSTRUCTION of the oil refinery at Dunkirk which is expected to be commissioned about the middle of next year is described in the April issue of " Naft Magazine " published by the Anglo-Iranian Oil Co., Ltd. Other features include: World Oil Production and Refining, second in a series of articles on the world's oil, and the construction of a large catalytic cracking plant and an ancillary equipment in Abadan, and the issue is well illustrated.

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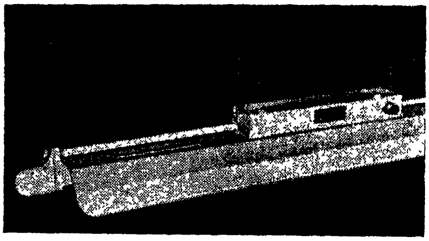
CHEMISTRY as a profession is discussed in an article " Should I Encourage My Son To Be A Chemist?" by Dr. A. W. Baldwin (Dyestuffs Division) in the April issue of the "I.C.I. Magazine" (Vol. 28, No. 162). The third of the series of articles on raw materials of the chemical industry deals with sulphur, air and water. There are, as usual, many excellent illustrations.

* * *

THE *Electrician* Blue Book Electrical Trades' Directory, the 68th edition of which has been published by Benn Brothers, Ltd. (£2 2s.), is recognised as the most comprehensive directory to the electrical and allied industries, their products and services and the professional and trading organisations associated with them. It contains some 50,000 references and its interest extends beyond electrical circles, embracing those who supply materials and equipment essential to the various branches of the electrical industry, and those concerned with the sale or use of electrical goods and apparatus, machinery and tools, motors, generating plant, vehicles, and so on.



[Courtesy of Crompton Parkinson, Ltd.

Dust and vapour-proof lighting fitting (A.V.1112) suitable for areas where moderate atmospheric concentrations of acid or alkaline vapour may be present. The ends are sealed by special silicone plastic washers

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ANTIHISTAMINES SCHEDULED

Additions to the Poisons List

ANTIHISTAMINIC drugs are to be added to Part 1 of the Poisons List and included in the first and fourth schedules of the Poisons Rules. Preparations for external application will be exempt. This news is conveyed in a Board of Trade statement issued this week announcing that statutory instruments are about to be issued implementing this and a number of other recommendations by the Poisons Board.

The other changes foreshadowed are:

DFP (Di-isopropyl-fluorophosphonate) will be added to Part I of the Poisons List and included in the first and seventh schedules to the Poisons Rules.

Deca-, Hexa-, Penta-, etc. methonium iodide will be added to Part I of the Poisons List and included in the first and fourth schedules to the Poisons Rules. They will be listed as " polymethylene bis-trimethyl ammonium salts."

Synthetic Drugs

The following drugs to which Part III of the Dangerous Drugs Act, 1920, is shortly to be applied will be added to Part I of the Poisons List and included in the first schedule to the Poisons Rules:—

Alphaprodine (α-4-propionoxy-4-phenyl-1 : 3-dimethyl-4-piperidine) its salts; Betaprodine (β-4-propionoxy-4-phenyl-1 : 3-dimethyl-4-piperidine) its salts; Hydroxypethidine (ethyl-4-*m* hydroxyphenyl -1- methylpiperidine-4-carboxylate) its salts ; Isoamidone (6-dimethylamino-4 : 4 diphenyl-5-methylhexan-3-one) its salts; Ketobemidone (4-propionyl-4-*m*-hydroxyphenyl-1 methylpiperdine) its salts; Methodl (6-dimethylamino-4 : 4 diphenylheptan-3-ol) its salts; Methadylacetate (6-dimethylamino-4: 4 diphenyl-3-hepylacetate) its salts.

• OVERSEAS •

Dutch PVC

The production of polyvinyl chloride by the Bataatsche Petroleum Mij. (Royal Dutch Shell) at Pernis is reported to be likely soon to make Holland self-sufficient in that material. The target figure is some 2000 tons a year.

Methyl Alcohol Duty Free

Canada is authorising the importation, duty-free from all sources, of methyl alcohol to be used by manufacturers for the production of formaldehyde. The new regulation is current until June 30 next year.

Chemical Industry in Pakistan

The Advisory Committee on the Chemical Industry in Pakistan has recommended to the Government that its supply organisation should encourage the chemical industry by purchasing indigenous products. The Committee deplored the fact that the Government of Pakistan were placing orders outside Pakistan while the goods were available at home.

Pharmaceuticals and the Canadian Market

In chemicals and pharmaceuticals of various kinds there is no indication that competition from British sources will increase to any considerable degree, and it does not appear that special efforts are being made to expand this trade.—The U.S. *Foreign Commerce Weekly* (38 (12), 8) in a review of Britain's trade prospects in Canada.

Plastic Resin for Casting

Important reduction of finishing of metal castings is claimed for a new use of thermosetting plastic material to bond sand moulds, being employed by the Crown Casting Corporation, Boston, U.S.A. The process was originated, in collaboraton with the Union Carbide & Carbon Corporation, by Johannes Croning, of Hamburg, Germany.

Financing German Chemical Research

The need to provide a fuller financial support for research work in Germany was stressed at a recent meeting at Bury Castle of the Arbeitsgemeinschaft Chemische Industrie, which represents all the chemical associations of the Federal German Republic. Comparisons were drawn between expenditure on scientific research in Germany and other countries and the need of Government support from public funds was emphasised. The chemical companies were also asked to donate funds.

U.S. Atomic Laboratory Fire

Damage estimated at £53,500 was caused by a fire which destroyed a United States atomic energy building at Berkeley, California, on April 23. The fire was brought under control before it reached the University of California cyclotron.

Steelworks for Ceylon?

Dr. J. Durrer, a Swiss metallurgist, recently arrived in Ceylon to advise the Ministry of Industry and Industrial Research on suitable sites for the proposed iron and steel works. He has already started to survey the island's iron-ore deposits.

Manganese Discovery in Norway

Deposits of manganese-ore, discovered recently at Sauda in the vicinity of Stavanger, are considered potentially important because the Sauda Iron Works is at present using South African manganese ore. Access to the newly discovered deposits is reported to be difficult.

Dutch-Finnish Plastics Agreement

The Dutch dye and varnish producer, Pieter Schoen and Sons, Zaandam, has established an affiliate at Hangö (Finland), Suomen Väriteolisuus Oy, in conjunction with a Finnish firm. The Zaandam firm is to supply the new company with raw materials for plastics

Ceylon's Coconut Oil Surplus

Although Ceylon is unwilling to sell on contract her exportable surplus of coconut oil to the U.S.A., the latter has been invited to buy the oil in the free market. The reluctance of the Ceylon Government is stated to be chiefly due to the desire not to alienate her present customers—Pakistan, India, the United Kingdom and European countries. The American inquiry for coconut oil came as a surprise to the Ceylon trade, as almost the entire requirements of coconut oil in the U.S.A. has been met by the Philippines.

Artificial Colouring Prohibited

The Madras Government has published a regulation to prohibit the addition of artificial colouring matter to any fat or oil intended for sale. This includes hydrogenerated vegetable products, but excludes butter. The amendment also provides that no person shall add any artificial colouring matter to fats and oils in the raw state. It was reported in the Dominion Assembly, New Delhi, that the price of vegetable oil in Madras had risen 200 per cent in two months.

Next Week's Events

MONDAY, MAY 1

Society of Chemical Industry

London : School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. Dr. E. B. Maxted : "Catalysis and the Poisoning of Catalysts."

The Chemical Society

Oxford : Physical Chemistry Laboratory, 8.15 p.m. Prof. A. R. Peters : "The Biochemistry of Fluoroacetate Poisoning and its Significance."

TUESDAY, MAY 2

The Institute of Metals

Swansea : University College, Metallurgical Department, Singleton Park, 6.30 p.m. Brigadier J. Gwynne Morgan : "Medical Aspects of Nickel Refining."

The Chemical Society

Exeter : Washington Singer Laboratories, 5 p.m. Prof. Brynmor Jones : "Some Aspects of Aromatic Substitution."

WEDNESDAY, MAY 3

North Western Fuel Luncheon Club

Manchester : Engineers' Club, 17 Albert Square, 12.45 p.m. Dr. F. Kind : "History and Outlook of Petroleum Refining."

THURSDAY, MAY 4

The Chemical Society

London : Royal Institution, Albemarle Street, W.1, 7.15 p.m. Tilden Lecture. Prof. F. S. Spring : "Recent Advances in the Chemistry of the Steroids."

Bangor : University College of North Wales, 5.30 p.m. (Joint meeting with college). Dr. E. J. Bowen : "Light-scattering and Chemistry."

Leeds Metallurgical Society

Leeds : University, Chemistry Department, 7 p.m. Annual general meeting, followed by junior members' papers.

The Royal Society

London : Burlington House, Piccadilly, W.1, 4.30 p.m. Prof. P. W. Bridgman : "Physics Above 20,000 Kg/cm.^{2}"

Royal Institute of Chemistry

Exeter : Washington Singer Laboratories, 3 p.m. Prof. R. P. Linstead : "Aspects of the Catalysed Addition and Transfer of Hydrogen in Organic Compounds."

FRIDAY, MAY 5

The Chemical Society

Southampton : Physics Department, University College, 5 p.m. Dr. S. H. Harper : "Recent Synthetical Developments in Pyrethrum Chemistry."

Birmingham : University, Edgbaston, 4.30 p.m. (with University Chemical Society). Prof. C. A. Coulson : "The Shape of a Chemical Bond."

Royal Institution

London : 21 Albemarle Street, W.1, 9 p.m. Prof. M. L. E. Oliphant : "The Generation and Use of Atomic Particles."

Royal Statistical Society

London : 2 Savoy Hill, W.C.2, 6 p.m. D. H. Read : "Experimental Designs and their Practical Application."

SATURDAY, MAY 6

Royal Institute of Chemistry

Swansea : Mond Nickel Co. works, Clydach. Works visit and discussion on "Safety and Hygiene in Industry."

USE OF ENERGY

British Association Programme

THE preliminary programme for this year's meeting of the British Association for the Advancement of Science, which will be held at Birmingham from August 30 to September 6, shows that the adaptation of energy to the service of man will be the main theme of the various discussions. Sir Harold Hartley's presidential address will be entitled "Man's Use of Energy."

In addition to the 13 sectional presidents' addresses, there will be three evening discourses which are always a popular feature of the meeting.

Dr. J. B. Conant, president of Harvard University and a former president of the American Association for the Advancement of Science, will present a paper on "An Experiment in the Study of Science by Non-Scientists."

For the first time in the association's history, an exhibition will be held in connection with this year's gathering. The display entitled "Man and Energy" has been arranged by the National Coal Board in collaboration with the British Gas Council, the British Electricity Authority and the Birmingham Municipal Museum

To encourage the interest of young scientific workers in the British Association, prizes to the value of 85 guineas for scientific essays are being awarded by *Endeavour*, the I.C.I. quarterly magazine. The association is also offering a prize of £10 for the best essay by an exhibitioner (guest member) on any aspect of the meeting.

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Prices of British Chemical Products

Upward Trend of Material Costs

STEADY trading conditions have continued generally on the industrial chemicals market, with a satisfactory demand reported from home consumers both as regards delivery specifications and the placing of new business. The volume of export trade continues to be maintained. Owing to an increase in the controlled price of pig lead, dry white lead and dry red lead prices have been advanced by £1 15s. per ton and £2 per ton respectively. The new basis price for dry white lead is now £114 10s. per ton and for dry red lead £105 per ton. The chief feature of the coal tar products market is the advance in home prices as a result of the increased duty on hydrocarbon oils.

MANCHESTER.—Apart from the non-ferrous metal products, prices of which have fluctuated in sympathy with the recent movements in copper, lead and zinc, there has been little change in values on the Manchester chemical market. Contract deliveries to the cotton textile and other principal industrial outlets have been on a satisfactory scale and traders report a fair amount of replacement buying. There has also been a fair trade for shipment. Superphosphates, sulphate of ammonia and the compound fertilisers continue to meet a steady seasonal demand. In the by-products market, with one or two exceptions, including cresylic acid, a fairly good movement of supplies is reported.

GLASGOW.—A number of price increases have been notified in the Scottish market during the past week. These have been the direct increases as a result of the Budget in the price of white spirit, and there have also been delayed increases as a result of devaluation. It is understood that a number of other increases are likely. In general, the supply position has been satisfactory.

Price Changes

Rises: Benzol, copper carbonate, glycerin, lactic acid, litharge, naphtha, red lead, sodium sulphide, sulphuric acid, toluol, white lead, xylol, zinc oxide.

Reductions: Pitch, potassium permanganate.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£160 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

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Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£140 10s. per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 7¼d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £108 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1260 s.g. 128s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £85 per ton; dark tech., £75 per ton ex works; barrels returnable.

Lead Acetate.—Nominal.

Lead Carbonate.—Nominal.

Lead Nitrate.—Nominal.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £105, orange lead, £117. Ground in oil: red, £128, orange, £140.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £114 10s. per ton, Ground in oil, English, under two tons, £135.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£105 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d. £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 8s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 8s. 8½d. per gal.

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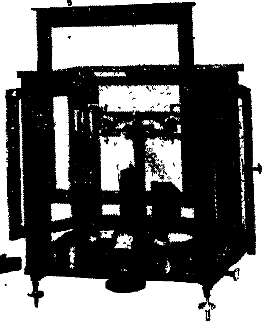

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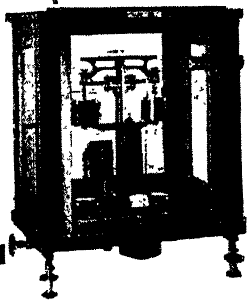

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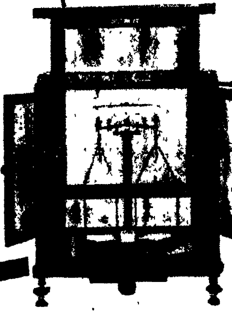

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Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £6 13s. to £7 13s. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—Manchester: 1s. 11d. to 3s. 2d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 16s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. Manchester: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 15s per ton, d/d, in drums; broken, £25 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—160° Tw., £6 16s. to £7 16s. per ton; 140° Tw., arsenic free £5 10s. per ton; 140° Tw., arsenious, £5 2s. 6d. per ton; Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £90; green seal, £89.; red seal, £87 10s.

Zinc Sulphate.—Nominal.

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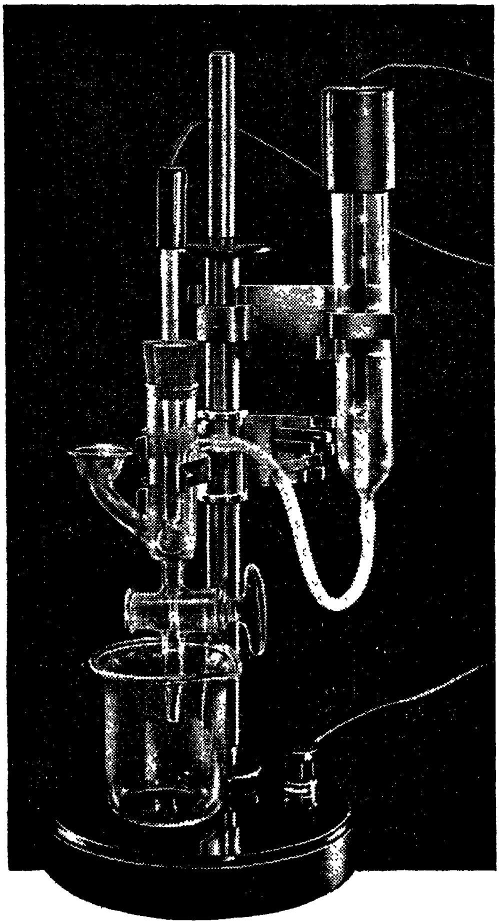

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Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £10 8s.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £16 8s. 6d., rising by 2s. 6d. per ton per month to June, 1950. National No. 2, £10 18s. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal, ex works: 90's, 3s. 3d.; pure, 3s. 5¼d.; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d. per gal.; 99%, 3s. 1d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 3s. 7d. per gal. for 1000-gal. lots; heavy, 90/190°, 3s. 1d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/160°, 21s. 6d. MANCHESTER: 19s. to 22s. per gal.

Toluol—Pure, 3s. 11d. per gal.; 90's, 3s. 1d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d, per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

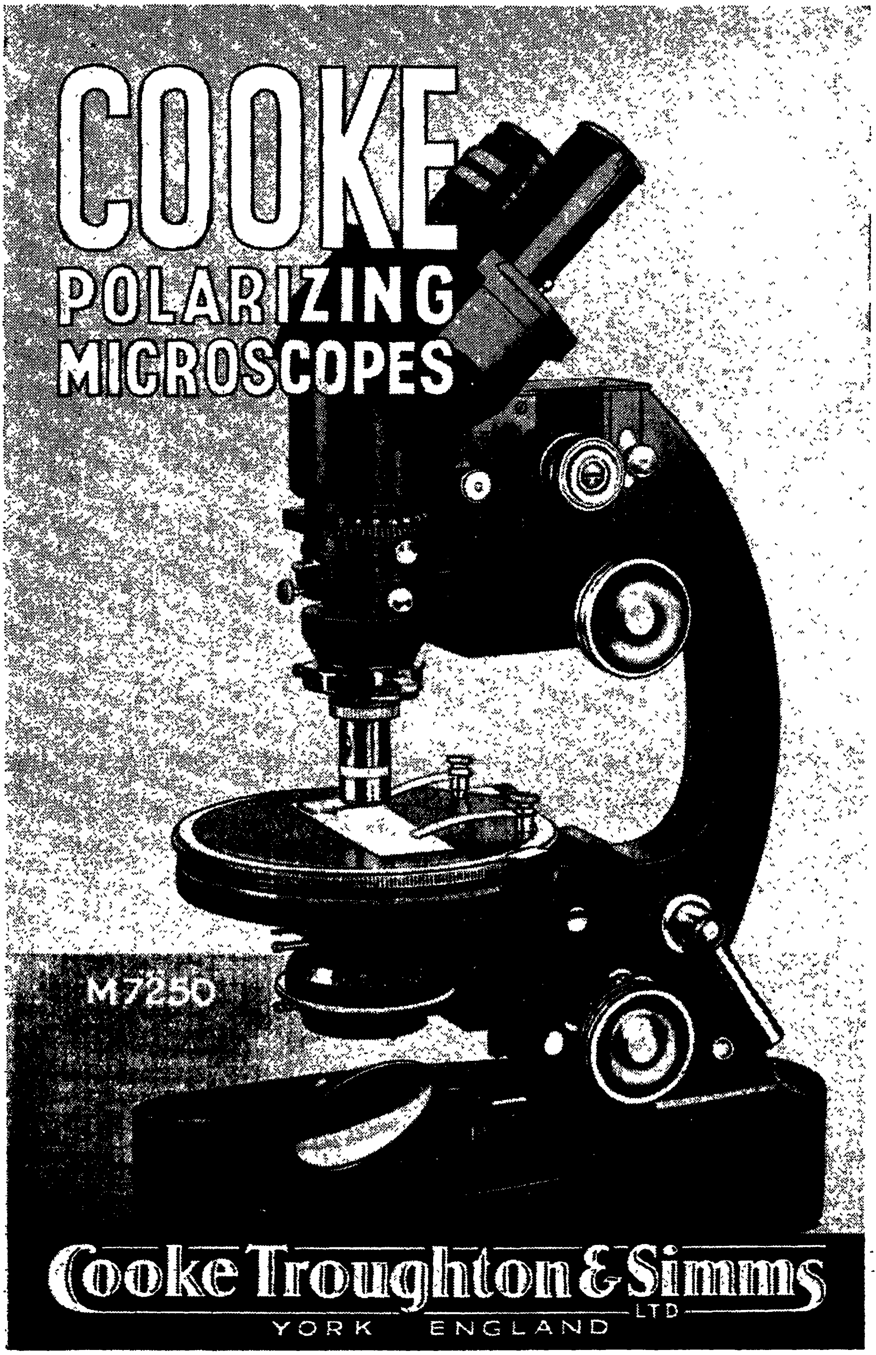
o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: April 25. The prices of all refined oils and fats remain unchanged during the eight-week period ending on May 17. The prices of all unrefined oils and fats remain unchanged during the five-week period ending on May 6.



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Chemical and Allied Stocks and Shares

RUBBER shares have been an active feature of the Stock Market on the sharp advance in the price of the natural product, which at 1s. 9⅝d. per lb. is the highest since 1926, and several pence above the level of the synthetic rubber in the U.S.

Further improvement in British Funds was due to continued expectations that the big British Electricity issue is pending, and to good market estimates of the possible terms. The continued request to limit dividends has prevented industrial shares attracting more than moderate attention.

Movements in chemical and allied shares did not exceed more than a few pence in most cases. Imperial Chemical were 42s. 7½d., Monsanto 48s. and Albright & Wilson remained steady at 28s. 9d. awaiting the results. Boake Roberts were 26s. and Laporte Chemicals 5s. units 9s. 6d. Elsewhere, Brotherton were 19s. 8d., Amber Chemical 4s. 9d., Bowman Chemical 5s. 3d., F. W. Berk 14s. 3d. and Pest Control 5s. shares were 7s. 9d. and Fisons 21s. 9d. Among preference shares, L. B. Holliday 4½ per cents were 19s. 9d., British Chemicals & Biologicals 4 per cents 16s. 9d. xd., and W. J. Bush 5 per cents 22s. 3d.

Borax Consolidated were firm at 51s. 6d., British Aluminium 39s. 9d., and British Glues & Chemicals 4s. units further strengthened to 21s. and British Oxygen at 93s. were steady, awaiting the annual meeting and news of the company's capital requirements. United Molasses eased slightly to 41s., Turner & Newall were 77s. 9d. and Associated Cement firm at 79s. 6d. on the results. Movements in shares of companies connected with plastics were mostly small. British Xylonite changed hands around 66s. 10½d., De La Rue were 20s. and Kleemann 1s. shares 8s. 3d. The 4s. units of the Distillers Co. have been 17s. 6d.

Iron and Steels were generally firmer, United Steel at 24s. 6d., at which there is a yield of 6½ per cent, while Hadfields, at 25s., return nearly 6¾ per cent. Guest Keen have risen to 42s. 3d. on the good results anounced by Guest Keen Baldwins. Results of Guest Keen itself are due shortly. Elsewhere, Powell Duffryn were steady at 29s. and Staveley firmer at 80s., as were Babcock & Wilcox at 58s. 3d.

Triplex Glass held their recent improvement to 18s. 9d. at which these 10s. shares yield 5¼ per cent on the basis of last year's 10 per cent dividend. United Glass Bottle were 69s. 4½d. and General Refractories 22s. 3d.

Glaxo Laboratories have remained at 47s. 9d., British Drug 5s. shares were 6s. 6d., with Boots Drug slightly easier at 46s. 3d. and Sangers 23s. Amalgamated Metal at 19s. 10½d. have been steady; there are continued hopes in the City that other metals in addition to tin will be freed before the end of the year and dealt in on the London Metal Exchange.

Oil shares have been uncertain. Shell were lower at 61s. 3d. attributed partly to U.S. selling. Anglo-Iranian were lower at slightly under £6¾, and Trinidad Leaseholds eased to 21s. 6d. Nevertheless, it is assumed in many quarters that, as far as home business is concerned, the effect of the increased petrol ration will probably more than offset the higher petrol tax.

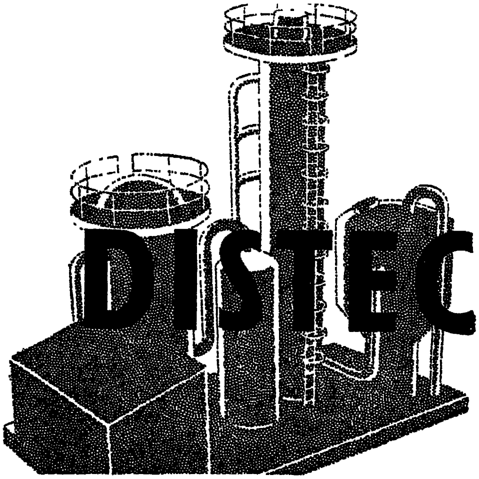
Vast French Gypsum Resources

THE increasing importance of gypsum for the dual purpose of cement and sulphuric acid manufacture lends interest to the large supplies of this mineral in France. V. Charrin has recently described these formations, emphasised their economic value and indicated their nature and origin.

Investigation of the gypsum-bearing Trias in Lorraine and elsewhere has revealed very extensive deposits closely resembling the anhydrite form. (*Chim. et Ind.*, 1950, *63*, 308-310.) Some of these in the south, *e.g.*, in Devoluy, such as the Suzette formation, are particularly rich in gypsum. One at Lazer is very extensive and contains some tens of millions of tons, and easily worked. Sulphur content is 56-57 per cent. In l'Ariège, at Bédeilhac, are the gypsum deposits that supply the works of Office Nat. de l'Azote of Toulouse. For ammonium sulphate manufacture, of which the annual production is 100,000 tons. Gypsum supplies in France are in fact practically inexhaustible. The Tertiary formations in the Paris region, though well known and extensively worked, are alone said to be almost limitless. There are further vast deposits in the Aix-en-Provence basin.

More Sicilian Sulphur

Italian exports of Sicilian sulphur in December last reached the exceptionally high level of 13,935 metric tons, more than twice as much as in December 1948.



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Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

SYNTICS, LTD., London, S.W., manufacturers and dealers in plastics, etc. (M., 29/4/50.) March 24, deb., to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *—. October 19, 1949.

TURKDEAN DEVELOPMENT, LTD., Cheltenham, manufacturers of chemicals and insecticides. (M., 29/4/50.) March 17, £5000 deb., to G. L. Pilkington; general charge.

UNIVERSAL CHEMICAL PRODUCTS, LTD., Birmingham. (M., 29/4/50.) March 25, deb., to Lloyds Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *Nil. Oct. 14, 1948.

Company News

Distillers Co., Ltd.

The directors of the Distillers Co., Ltd., anonunce that they have declared a dividend on the preference stock for the six months ended March 31, at the rate of 3 per cent less income tax, payable on May 15, to stockholders on the register at April 20.

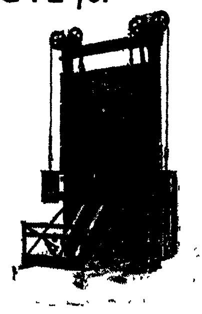
New Registrations

Bottogas, Ltd.

Private company. (481,121). Capital £300,000. To acquire and hold shares, stocks, debentures, etc. Power is also taken to carry on business as producers, refiners and storers of butane, propane, coal gas and inflammable substances and materials, petroleum and petroleum products, etc. Solicitors: Slaughter & May, 18 Austin Friars, E.C.2.

Manufacturers Supply Co., Wickham, Ltd.

Private company. (481,202). Capital £1000. To acquire the business of manufacturers of scientific instruments, pressed and blown glassware, vacuum containers and technical consultants, now carried on by F. A. Plummer and H. G. Flood at 19 Glebe Way, West Wickham, Kent, as "Manufacturers Supply Co." Directors: H. G. Flood, 19 Glebe Way, West Wickham, Kent; and L. A. Eley, 65 Wickham Chase, West Wickham, Kent. Reg. office: 19 Glebe Way, West Wickham, Kent.



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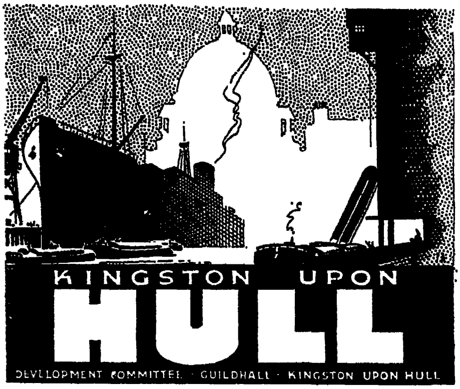
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Volume LXII 6 May 1950 Number 1608

Neglected Fertiliser Research

THE world's fertiliser industry was founded by Sir John Bennet Lawes when he began to manufacture superphosphate in 1840/41, first in his own farm sheds and then in a factory at Deptford, London. To what extent the idea of acid treatment came from Liebig, who had suggested it in his statement of the mineral theory of plant nutrition, is controversy which had better be left to chemistry's historians. As a technological development, all the credit for superphosphate must certainly be given to Lawes and this country.

After 30 successful years as a fertiliser manufacturer, Lawes sold his business and retired to his own Hertfordshire estate to devote himself to research. His farm there was already the centre of continuous field tests. Eventually he "ploughed back" a large proportion of his profits as a manufacturer into the founding of the Lawes Agricultural Trust, and the farm he had inherited as a young man became the Rothamsted Experiment Station, the prototype of all agricultural research stations in this country, the United States, and, indeed, the world. Today this same trust manages Rothamsted.

This may now seem dusty history. The contemporary importance lies in the fact that Rothamsted depended for at least its first half century upon the vision of a manufacturer and his willingness to devote his own commercial fortune and inherited property to research. It is ironic that Rothamsted fertiliser research, then and now, has been entirely devoted to their use; so, too, has been the research at all other British centres since established. There has never been a national research station to study the problems of fertiliser manufacture, and it is only in the past two years that the British industry has begun to discuss the formation of a co-operative research association with these special aims. (THE CHEMICAL AGE, *60*, 497; *62*, 217).

The anomaly which the absence of such a British centre represents was emphasised by Dr. K. D. Jacob's paper on the fertiliser technology research of the U.S. Department of Agriculture, read in London on April 21 by two members of his staff now visiting this country, Mr. John O. Hardesty and Dr. Kenneth G. Clark. As long ago as 1911 the U.S. Congress provided funds for fertiliser technology research on a continuing basis. In 1921 a research laboratory devoted to fixed nitrogen and originated by the War Department

On Other Pages

Leader:
Neglected Fertiliser Research . . 667
Notes and Comments:
Reduced Profits . . 669
Growing Competition . . 669
Exhibition Problems . . 669
Another Strategic Material . . 670
Forgotten Steel Men . . 670
New Atomic Research Tool . . 671
PTFE Supplies . . 671
Belgian Chemical Dismissals . . 671
Microchemical Congress . . 672
Chemicals in Egypt . . 672
Stearic Acid Imports . . 672
Young U.K. Scientists in U.S.A. . . 673
Royal Society Recognition . . 673
Metal Price Changes . . 673
Parliamentary Topics . . 674
Abyssinian Oil Seeds . . 674
British Ceramics Progress Reviewed . 675
Carbon Monoxide Detector . . 676
Fertilisers in Spain . . 676
The Future of Analytical Chemistry . 677
Heptafluorobutyric Acid . . 681

METALLURGICAL SECTION

Growing Field of Resistant Metals . 683
Lead Deposits in Derbyshire . . 684
Thallium—A Neglected Element . . 685
Production and Stocks of Non-Ferrous Metals . . 686
Minerals of the Belgian Congo . . 687
Sources of Metal Corrosion . . 688
Accounts and Taxation . . 690

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was placed under charge of the USDA.

The Division of Fertilisers and Agricultural Lime, now a section of the Bureau of Plant Industry, Soils, and Agriculture Engineering, is responsible " through research and investigation, to point the way to the development of more efficient fertilisers and liming materials and to the lowering of the cost of plant nutrients to the farmer." Some of its most notable achievements, enumerated in Dr. Jacob's paper, have been the development of efficient catalysts for the synthetic ammonia industry; the study of transforming synthetic ammonia into other materials, such as urea; the development of ammonium nitrate for fertiliser use; the pioneering of furnace processes for producing phosphoric acid and of defluorinated phosphate rock; the ammoniation of superphosphate; and (1911-1921) the search for native potash deposits and their development.

With mixed or compound fertilisers, which today comprise 70 per cent of the tonnage used on U.S. farms, the Division has particularly studied the technical aspects of high analysis and physical properties. All this research is conducted in close co-operation with manufacturers and its results are readily available to the industry.

In the past two or three decades there have been many more technological innovations in the American than in the British industry. American farmers are using large tonnages of fertiliser materials not yet developed here. Granulation, particularly of compound fertilisers, has been pioneered in Britain, but this could be described as an enforced innovation, necessary because the poor condition of powder-type compounds slowed the development of combine drills.

Dr. Jacob's paper could not have been read here at a more opportune time. If there were still doubts as to the advantages of a research centre for fertiliser manufacturing problems, this paper may have disposed of them. The current project of the industry to form a research association certainly appears to have been strengthened by the survey of the United States agriculture department's activities in the past 30 or 40 years.

The Fertiliser Society, itself a fairly new British development, is to be congratulated for arranging so stimulating a meeting.

Notes and Comments

Reduced Profits

SOME of the difficulties with which large-scale chemical producers were faced last year have been reflected in the trading results of the large groups, of which the most revealing are Imperial Chemical Industries', showing that group profits before taxation were £17,323,509—against £22,955,579 the year before. The I.C.I. result cannot be entirely dissociated from the lower level in 1949 of chemical export trading, to which the group is so large a contributor, and there would seem to be good reasons to expect that the I.C.I. fortunes will have since shared the more buoyant trend in the recent export figures by all chemical groups. That, however, is outside the scope of the current report. The preliminary financial summary throws light on some current charges upon industrial chemical production, such as the obligation to provide for tax purposes nearly £6.5 million and almost as much (£6 million) for plant obsolescence and depreciation. The vast influence of the tax demand upon the final state of group profits, which were £10.8 million last year and £11.89 million the year before, is apparent in the fact that the 1949 tax charge was some £4.56 million smaller than in 1948.

Growing Competition

IT is reassuring to note, in relation to the minor setback experienced by Britain's largest chemical group, that much more stubborn trading problems appear to have confronted comparable chemical enterprises in Switzerland. In Basle, Ciba, Ltd., managed to maintain earnings pretty well (S. Fr.14.04 million compared with S. Fr.14.12 million in 1948) but does not disguise the fact that this was aided, probably temporarily, by the continued difficulties in re-establishing the competitive industries in Germany and some other countries. Devaluation, in which Switzerland did not participate, is admitted to have dealt a fairly heavy blow to the group's sales prospects in the export markets, to which Ciba's response will be to intensify the activity of its overseas subsidiaries. The large productive unit at Horsham, Sussex, and that at Summit, U.S.A., are likely to be very active participants in the policy of expanding pharmaceutical production in the countries providing the markets. The justification of that policy is contained in the fact that the various overseas branches in 1949 were responsible for more than four-fifths of all sales. Sandoz, Ltd., confirms Ciba's observations concerning the heightened difficulty of dyestuffs trading in the export markets. Devaluation and uncertainty of textile industries have produced some sharp declines in the Sandoz figures.

Exhibition Problems

WITH the opening next week of another British Industries Fair comes the temptation to question why chemical and allied manufacturers are again represented by a decreased number of exhibitors. Last year there were 69—12 fewer than in 1948—and this year the number may be as low as 54; they will, however, occupy 26,600 sq. ft. of floor space, compared with 25,000 sq. ft. in 1949. It may be that the large manufacturer, with its greater financial resources, is better able to bear the high cost of erecting and maintaining a stand and derives more material benefits from the prestige of such an exhibition. In support of this theory is the continuing tendency of certain smaller firms to share stands. The persistent difficulty of arranging a display of chemical materials in a way that will catch the eye remains as real as ever. (Of some 6000 chemicals listed in the ABCM's directory, about 95 per cent are whitish powders or colourless liquids.) To circumvent that kind of obstacle the chemical manufacturers at a large trade exhibition may show diagrams, working models, photographs or, where possible, finished products and consumer goods. In recent years they have shown commendable enterprise in this way. The SIMA states that there will be about the same number of firms exhibiting scientific instruments at this year's Fair. This, in view of the fact that the association is sponsoring a large display at the Canadian International Trade Fair in Toronto later this month and is already implementing its advanced plans for the Festival of Britain, may be taken as evidence of the healthy state of that industry, which is the greatest ally of modern analytical chemistry.

Another Strategic Material

ONE of the newer plastics raw materials, polytetrafluoroethylene (PTFE), is in danger of being relegated to the restricted department of "strategic necessities". At present, even at the extremely high prices ruling, the demand—a substantial proportion of which comes from abroad—is reported to be much greater than can be satisfied by the limited quantities being produced here. "Supplies have, of necessity, to be regulated," say the Government officials concerned. There have, however, been exports of a few minor quantities and it is intended that one or two outstanding overseas orders shall be filled if supplies permit. Meanwhile, the Ministry of Supply is said to be able to absorb all the PTFE being made here. The prospect of large-scale exports, the request for which has been attested by inquiries received by this journal, is not at the moment to be entertained. I.C.I., Ltd., the PTFE producers here, is about to overhaul its productive plant, with the aim of doubling its present output. Even then, say the experts, it is likely to be a further two or three years before production in this country can catch up with orders now being offered. If the demand continues on its present scale—as it appears likely to—it is seriously suggested that the time may not be remote when the Board of Trade, which handles this material for export, will have to consider importing PTFE from the U.S.A., the only other country where it is made. The principal outlets for the PTFE produced in this country are at present packings and electrical components, but a demand which is waiting to be filled, when supplies of the raw material become more adequate and when quantity production reduces prices, is for coverings of high heat resistance, for tables and the like, for which PTFE is said to be eminently suitable.

Forgotten Steel Men

THE alacrity with which decisive achievements in the early history of the modern iron and steel industry are forgotten is pointedly illustrated by the fact that few to-day can call to mind the debts which the industry owes to the Mushet family. Intent on seeing that recognition is given to a family whose collective contributions profoundly influenced the course of iron and steel making in the 18th and 19th centuries is Mr. F. M. Osborn, chairman of a Sheffield steel firm. He has a rich subject in David Mushet, his son Robert Forester and his brother, also Robert. David Mushet, who discovered the economic importance of the Blackland ironstone in Scotland and became one of the foremost authorities in iron and steel production, produced all the advances to his credit by his own unaided experiments "after hours" and ultimately in the face of a good deal of opposition by his employers, the Clyde Iron Works, whose accountant he was in 1792. Eight years later his enterprise, and apparently the jealousy felt by his empolyers, robbed him of his job as an accountant—a fortunate circumstance for the ferrous metal industries. His son inherited his gifts and made good use of them, most memorably in his improvement of the Bessemer steel process by the addition of molten spiegeleisen (an iron and manganese alloy), which gained him the Bessemer Medal of the Iron and Steel Institute in 1876. About the forebear of this distinguished "steel family", William Mushet of Dalkeith, not even the date of his birth is known. The biographer would welcome any information about the early antecedents of the Mushet family.

NEW ATOMIC TOOL

Linear Accelerator at Harwell

ATOMIC particles can, it is stated, be made to travel at almost the speed of light—186,000 miles per second—in a new research instrument which has just started operating at the atomic establishment at Harwell, Berks. The new machine—a travelling wave linear accelerator—will make possible a big extension of important research work in the design of atomic piles, including those for the production of power. It generates energies of 3½ million electron volts, and radiation of such an intensity that it has had to be installed in its own shelter, in which the walls and roof are made of brick and concrete 4 ft. 6 in. thick.

This is the second high-powered particle accelerator to start working at Harwell. The first was the synchro-cyclotron which began operating in December. The difference between the two is that the first speeds up particles in a circular path, and the new machine in a straight line.

Measuring Nuclear Properties

Some of the most important work in the development of atomic energy is the measurement of nuclear properties of materials and particularly the interactions of neutrons with the atoms of various elements.

The new machine provides a prolific and convenient source of neutrons for such studies. The neutrons are not produced directly; instead, the machine gives out a series of intense short bursts of high energy electrons aimed at a heavy metal target. The impact with the metal produces a corresponding series of bursts of gamma rays. Most of these gamma rays are in turn absorbed in a tank of heavy water; the heavy hydrogen nuclei in the water then break up and emit the neutrons.

A powerful radio transmitter working on a wavelength of 10 cm. provides the electric waves which first speed up the electrons. As many as 1000 million neutrons may be liberated every second by the machine. This intensity is 1000 times greater still in the short pulses, each of which is only 2-millionths of a sec. long.

The basic design was carried out by a group of the Harwell staff, while the development and construction has been done at the Mullard Electronic Research Laboratories of Philips Electrical, Ltd. A similar machine has been operating for some time at the laboratories of the AERE group at Malvern.

PTFE SUPPLIES

Priority Claim of Official Departments

A STATEMENT dealing with the continued relative scarcity of polytetrafluoroethylene plastic material (*page* 670 *this issue*) was issued this week by the plastics division of I.C.I., Ltd.

This says that the reason for the present shortage of this polymer (Fluon) is that the output of the existing plant is largely taken up with Service and other Government requirements. However, firms requiring Fluon in connection with Government contracts or sub-contracts may be able to obtain it by stating the particulars to their local I.C.I. sales office, which will seek permission from the Ministry of Supply to deliver the material.

A small quantity has been set aside for purely commercial development during 1950 and part of this has been issued to fabricators who are already experienced in handling the polymer. The remainder will be held for issue to other firms which develop processes requiring its use.

The plastics division observes that it would help to economise supplies if firms would, whenever possible, order cored mouldings instead of ordering solid sections and boring these out themselves. Cored mouldings are often more easily manufactured, in addition to saving polymer, and will help the user by reducing the work which he has to carry out.

Belgian Chemical Dismissals

DIFFICULTIES which have for some time affected the Belgian chemical and allied industries are reported to have been intensified during the last 18 months. The industry employs normally some 50,000 to 60,000 persons but it had to dismiss about 20 per cent. Further dismissals are considered likely. Manufacturers ascribe their difficulties largely to the high cost of coal, which makes it impossible to quote prices which could stand the increased competition by leading foreign chemical manufacturers. The revival of the German chemical industry has also played a considerable part. It is claimed that the liberalisation of trade in Western Europe has in many cases been made illusory by the imposition of new tariffs. Chemical exports, which normally amount to about 10 per cent of the country's total export trade, are still hampered by lack of quota allocations.

MICROCHEMICAL CONGRESS

Many Countries Represented

AT least 19 countries will be represented at the First International Microchemical Congress, to be held in Graz, Austria, from July 2-6. Other applications are still awaited.

Papers, which will ultimately be published in full in *Mikrochemie vgt. mit Mikrochimica Acta,* include the following:

"The Use of Organic Complexes for the Separation and Estimation of Metals by Extraction Methods," by E. Abrahamczik, Germany; "Micromethods in the Testing of Materials," by F. Feigl, Brazil; "The Intellectual Basis for the Development of Micromethods," by A. A. Benedetti-Pichler, U.S.A.; "Some Work in the Sphere of Organic Quantitative Microanalysis," by W. Kirstan, Sweden; "The Rôle of Microchemistry in Relation to New Domains of Analytical Chemistry," by P. W. Wenger, Switzerland; "Microscopic Methods in Microchemistry," by L. Kofler, Austria: "Twenty-five Years of Quantitative Microchemistry in the U.S.A.," by J. Niederl, U.S.A.; "Rapid Micro Combustion Methods for the Determination of Elements in Organic Compounds," by G. Ingram, Great Britain; "Microchemical Methods Applied to Industrial Materials," by C. E. Spooner, Great Britain; "The Separation of Metal-Organic Complexes," by C. L. Wilson and A. K. Almahdi, Great Britain; "Interesting Examples of General Microchemistry," by R. Strebinger, Austria; "Fibre Chromatography," by G. Skalos, Greece: "Trace Detection of the Rarer Elements Using Luminescence Analysis," by H. Haberlandt, Austria; "Applications of Microchemistry to Exploratory Industrial Research," by N. Cheronis, U.S.A.; "Automatic C-H-Determination as the Basis of O-Determination, and a New Micro N-Determination," by J. Unterzaucher. Germany; "Microestimation of Halogens, Sulphur and Selenium Spectrochemically," by A. Gatterer. Vatican; "The Determination of Carbon and Hydrogen in Fluorine-containing Compounds." by R. Belcher and H. Goulden, Great Britain; "Estimation of Small Amounts of Sulphur or Sulphur-bearing Plant Substances," by H. Roth, Germany; "Living Cells as Micro Reagents," by B. Flaschentrager, Egypt; "The Standardisation of Microchemical Apparatus in the U.S.A.," by H. K. Alber, U.S.A.; "Outlines of General Microchemistry," by G. Gorbach, Austria; "Instructional and Experimental Development of the Reactions of the International Committee on New Analytical Reactions," by B. J. V. Cuvelier, France; "Narcosis of Protoplasm," by W. Seifriz, U.S.A.

Stearic Acid Imports

DURING the period from May 22 to September 30 individual import licences will be granted for limited quantities of double and triple pressed stearic acid consigned from, and originated in, any country other than: Albania, Argentina, Belgium, Belgian Congo, Bolivia, Bulgaria, Canada, Colombia, Costa Rica, Cuba, Czechoslovakia, Dominican Republic, Ecuador, El Salvador, French Somaliland, Germany (Russian Zone), Germany (Western), Gautemala, Haiti, Honduras, Hungary, Iran, Japan, Liberia, Luxembourg, Mexico, Nicaragua, Panama, Philippines, Poland, Roumania, Switzerland, Tangier, Uruguay, United States of America, U.S.S.R. Venezuela, Yugoslovia.

CHEMICALS IN EGYPT

Development of Local Resources

THE growth of the chemical industry in Egypt owes its promise of success, among other factors, to an abundance of raw materials and unlimited labour.

According to official sources, 25 factories, employing 5000 men, are producing vegetable oils from cotton seed, linseed, sesame and groundnuts. Annual output is estimated at from 65,000-75,000 tons of oil, of which 7000 tons are used in industries, including 2000 tons for soap, the balance being used as food.

The latest available statistics put the number of soap factories at 213, representing an invested capital of £E8 million and employing 4000 nationals. Ten of the factories are rated "modern."

Production is expected to be increased as soon as oil and imported caustic soda are more freely available.

Caustic Soda

Under a recent barter agreement Italy sent Egypt an agreed quantity of caustic soda in exchange for 20,000 tons of phosphates.

Egypt's annual consumption of caustic soda is estimated at 14,000 tons, of which only 6500 tons are produced locally, nitrate being extracted from the lakes in the regions of Wadi Natroun and Hoch-Issa.

Sulphuric acid is being produced commercially by a factory employing 346 men at Kafr-El-Zayat, but the imported product is, however, said to have some advantages.

Glycerine, industrial and medicinal, is produced by three factories, with an intake of 40 tons a month. This quantity permits an exportable surplus.

Some fertilisers are still being imported and recent tenders accepted by the Government include 26,000 tons of lime superphosphates from Italy and 10,000 tons of ammonium sulphate from Hungary.

The prospects of developing a prosperous cellulose industry utilising reeds are reported by Italian experts to be excellent.

The paper manufacturing industry is well established and concentrates mainly on cardboard and wrapping papers. Pre-war production reached 17,000 tons. It is hoped that Egypt will before long be able to meet its annual newsprint requirements which are assessed at less than 7000 tons.

Perfumes and cosmetics have always been a relatively good market and Egypt has now entered this field as a producer. Some £E100,000 has been invested in 10 factories now employing about 600.

U.K. SCIENTISTS IN U.S.A.

Study of American Technology

A SMALL but important Marshall plan investment has been made in two young British scientists now studying at the University of Wisconsin—states the University of Wisconsin News Service.

The two men—Mr. Victor Morris and Dr. Thomas Walker—are among 50 persons from the United Kingdom now attending American universities or working in American industry, principally to study American technology. Both will spend part of their two-year scholarship period at the University of Wisconsin and part at work in industrial organisations, learning first-hand the technical operations that can be of value to Britain.

Practical Experience

Mr. Morris, 21, who was awarded his B.Sc. degree at the University of Leeds, plans to divide the time evenly between Wisconsin and a chemical organisation, while Dr. Walker, 25, who has a doctorate of the University of Glasgow, will leave, after a semester at Wisconsin, for practical training in a phamaceutical house.

Mr. Morris was working at I.C.I., Ltd., Runcorn, and Dr. Walker was engaged in drug research for the Glaxo Laboratories, Ltd., London, when their Marshall plan scholarships were granted.

"Although Britain and the U.S. are about equal in basic or pure research," Dr. Walker said, "the U.S. is somewhat faster at putting new research findings to use, in bringing new drugs, for example, up from the laboratory and into production."

Royal Society Recognition

THE following were elected foreign members of the Royal Society at its meeting in London last week: DR. WALTER SYDNEY ADAMS (Pasadena) who is distinguished for his contributions to solar and stellar spectroscopy; PROFESSOR CARL FERDINAND CORI (St. Louis), noted for his work on metabolism of carbohydrates in the animal body; PROFESSOR ENRICO FERMI (Chicago) who has made important contributions to theoretical and experimental physics, especially in statistics and the properties of slow neutrons; PROFESSOR CARL JOHAN FREDRIK SKOTTSBERG (Gothenburg), who has made notable contributions to the study of the geographical distribution and taxonomy of plants.

Mr. Victor Morris (standing) and Dr. Thomas Walker at the University of Wisconsin where they are spending part of their two-year scholarship period

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Metal Price Changes

A FURTHER increase in the price of good soft pig lead by £2, from £86 to £88 a ton, delivered, was announced by the Ministry of Supply last week.

The maximum price of basic pig-iron was increased, as from May 1, under the control of Iron and Steel (No. 78) Order, 1950. This is an adjustment within the steel industry and the price of pig-iron and steel to outside consumers will not be affected.

An immediate increase in the price of good ordinary brand zinc was announced by the Ministry of Supply on Tuesday last, May 2. The price was raised by £2, from £95 10s. to £97 10s. a ton delivered. Prices of zinc oxides were raised by £1 15s. a ton as follows: Red seal from £91 to £92 15s.; Green seal from £92 10s. to £94 5s. and White seal from £93 10s. to £95 5s.

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165 Student Technologists

Over 165 textile students at centres in all parts of the world are expected to sit for the Textile Institute's examination in general textile technology on May 20.

PARLIAMENTARY TOPICS

Projected Oil Refineries

REPLYING to a question regarding the building of an oil refinery at Tynemouth, Mr. P. Noel-Baker, Minister of Fuel and Power, said that the project had been approved in 1947. To make necessary provision for the refinery in the capital investment programme for 1950, the firm had recently been asked when it hoped to begin building. The firm stated it would not be able to start this year.

FACTORY Inspectorate vacancies were again the subject of questions in the House. Mr. G. Isaacs, Minister of Labour, stated that there were at present 51 vacancies and two open competitions were being held this year with a view to filling them. In the last three years there had been some 90 recruits. Other points raised were whether the starting salary of £350 a year for a graduate of 21 or 22 was adequate to attract the right type of man, and whether any preference was given to ex-service men over 40 years of age.

EXCHANGE of scientific data between British Guiana and the neighbouring Latin American Republics and French and Dutch territories, was raised by Mr. Peter Smithers. In reply Mr. J. Griffiths, Secretary of State for the Colonies, said that following a visit of the Governor of Surinam and the Prefect of French Guiana last year, there had been a useful exchange of information between technical officers of the three governments. Similar visits had been arranged with Brazil and Venezuela. Opportunities to exchange scientific data were also provided by the Caribbean Commission, and through international technical conferences in Central and South America.

ASSURANCE that iodisation of salt would neither affect the taste or the price, was given by Mr. M. Webb, Minister of Food, in reply to a question from Mr. Hugh Fraser.

THE Minister of Supply stated on Monday, May 1, that he was not at present prepared to abandon bulk buying of lead as the relative abundance of the metal might prove to be only temporary. He was not yet prepared to disturb the existing arrangements which enabled us to obtain maximum supplies of sterling metal and to control effectively the expenditure of dollars and other hard currencies. Selling price of virgin lead in the U.K. was no higher than in the U.S.A. and the chief continental countries.

(*continued at foot of next column*)

ABYSSINIAN OIL SEEDS

Increase in Exports

EXPORTS of oilseeds from Ethiopia (Abyssinia) increased from 476 tons in 1946 to 14,772 tons in 1948—according to returns of the Franco-Ethiopian Railways. The principal oilseed at present is linseed, followed by sesame and nug, the last being uniquely an Abyssinian product. It is a very hard and extremely small seed, about 200 weighing a gramme. Its oil content is 36-38 per cent.

For 1949, the exports will have been much larger; during the first quarter alone they amounted to 12,000 tons carried by the F.E. Railways.

M. Stephane Guyot has given an interesting illustrated account (*Oléagineux*, December, 1949, pp. 715-719) of further possibilities in this country of 10 million people, still primitive but much more amenable to training, especially in agriculture, than many other African peoples. Manufacturing industry on the cottage or village scale, as in India, would probably suit the majority better than large factories of the European type. Much of the country is fairly fertile, and oilseeds should provide 200,000 tons for export in the course of a few years.

Manx Seaweed Processing

A Manx Government Commission investigating the commercial use of seaweed stated in a report published last week that the collection and processing of button wraick could be developed into a profitable off-season industry.

WHAT progress was being made with the mining or brine pumping of the potash deposits near Whitby, was asked by Colonel R. S. Clarke. Deep boring to prove and determine the extent of the deposits has been in progress during the last 12 months replied Mr. H. Wilson, President of the Board of Trade, but considerably more investigation was necessary before plans could be made for working them.

COMPARATIVE figures for the carbon content of the atmosphere in Stoke-on-Trent and Nottingham, were asked for by Dr. Barnett—Stross. No such figures were available, replied Mr. Herbert Morrison, Lord President of the Council, as although measurements of smoke and deposited matter, including carbonaceous matter, were sent to the DSIR by the city of Stoke-on-Trent, no such reports were at present made by Nottingham, but observations were to begin shortly.

BRITISH CERAMICS PROGRESS REVIEWED

Jubilee Celebrations in the Midlands

MORE than 400 members of the British Ceramic Society met on April 25 at Stoke-on-Trent to celebrate the 50th anniversary of their society. They included scientists and technologists engaged in the pottery, refractory materials and allied industries and visitors from overseas.

An extensive 3-day programme arranged by Dr. A. T. Green, the general secretary, included civic receptions, works visits, exhibitions, and the reading of technical papers by leading scientists.

Following the reception at Stoke Town Hall by the Lord Mayor, who delivered a brief address of welcome, the society's president, Mr. M. S. Whitehouse, outlined the work and progress of the three sections (pottery, refractory materials and building materials).

On April 26, the three sections held separate meetings to hear and discuss papers. The pottery section meeting was held at the North Staffs. Technical College, Stoke-on-Trent, and the building materials and refractory materials sections met at the Palace Hotel, Buxton.

A paper entitled " Fifty Years of Progress in Ceramic Whitewares " was read to the pottery section by Dr. W. L. German and W. L. Ratcliffe.

Little change had taken place in the preparation of ball clays, the authors said. In the past few years the production of dried air floated clays had been begun, although, as yet, there was no sign that the majority of potters regarded the increase in cost as worth while. This contrasted with the U.S. practice in which dry ground clays were essential for the dry mix process.

China Clay Research

Considerable research had been carried out on the properties of china clay, and centrifuging was now being adapted to control the grain size of various grades. De-watering was done extensively with filter presses, instead of the heated floor kiln.

During the past ten years, investigations had shown that a change in the specific gravity of flint occurred on calcination at temperatures as low as 300° C., with only a slight change in value up to 900° C. The alteration in specific gravity at the low temperatures was due to liberation of water and not to any change in the flint to cristobalite, as was previously thought.

The grinding of flint and stone in pans was now tending to change over to cylinder grinding. The latest development was the " closed circuit " method, in which the material was continuously removed from a cylinder and its grain size checked with a classifier.

In the preparation of bodies for whiteware, dry and wet methods of mixing were still used, with the dip stick as the measuring device. Steel presses were taking the place of wood, and nylon press cloths had been introduced. De-airing pugs were more widely used and improvements had been made in the design of lawns and magnets. The addition of small amounts of ball clay, bentonite, and Florida kaolin to the bone china body (to allow working with machines) was now more widely practised.

Lead Poisoning

Recalling that in 1898 there were 457 cases of lead poisoning reported in the industry, the authors said that the pottery regulations of 1913, and the introduction of low solubility glazes greatly reduced the incidence of the disease. In 1949 no cases were reported.

Much had been reported on the effect of certain materials on the solubility of lead frits. Alumina and titania had a marked effect on reducing the solubility, boric acid showed a high solubility. An important contribution to the solubility of frits was made in 1948 by H. L. Podmore; he coated the frits with an insoluble material and thus enabled a frit of high lead content to pass the Government solubility test.

The importance of viscosity and thixotropy in glaze control had begun to be appreciated. Glaze control was now, roughly speaking, the control of differential sedimentation of heavy or large particles and the attainment of the correct thickness of glaze by control of viscosity and thixotropy.

In the U.S.A. the trend had been to use pyrophyllite and talc for the construction of bodies, but these materials had not made much headway here because of their high cost.

In his paper " Developments in the Manufacture of Silica Bricks," Mr. R. T. Lynam referred to the origin and historical background of silica brickmaking, and reviewed the conditions and methods of manufacture during 1900-25. He emphasised the importance of the Workmen's Compensation (Silicosis) Act of 1919, and described its contribution to present hygienic conditions in the industry.

From 1920, the speed of development had increased with the adoption of silica products for use in the carbonising industries, especially for coke ovens. An important event was the founding of the British Refractories Research Association, which considerably strengthened the scientific approach problems concerning the manufacture and use of silica.

On the final day of the celebrations, papers were read at the North Staffs. Technical College on the subject of education in the ceramic industries. One of these was "The Universities and Ceramic Education," by Prof. A. L. Roberts, of Leeds University.

At university faculties, the professor said, men were given sound preliminary training in pure science and engineering, followed by systematic instruction in applying that science to specific industrial fields. This was the true technologist, the man who approached his subject through the study and application of the underlying science and not by first learning the operating technique.

Prof. Roberts considered there was no general case for the establishment of new technological institutes or for dissociating technological departments from the universities. The number of technologists could be sufficiently increased by expansion of the universities. A few new technical colleges might be necessary in certain cases.

There were in Britain no immediate facilities for first degrees in ceramic technology. This was in marked contrast to the position in the U.S.A., where some 250 graduates were produced annually. In Prof. Roberts' opinion degree courses were urgently required. The needs of the industry would not be met by men with post-graduate qualifications.

He had therefore proposed to the University of Leeds that a course leading to the degree of B.Sc. with Honours in Ceramics should at once be instituted. The course would cover four years following matriculation. His proposals had still to be ratified by the Senate and Council of the University.

Carbon Monoxide Detector

A NEW instrument for the detection of carbon monoxide in the atmosphere has been developed at the National Research Council of Canada.

The detector, which weighs only a few pounds, is the result of the collaboration of Dr. Morris Katz and Dr. John Katzman, both of Ottawa. The general idea is not new, but there are important differences in the utilisation, developed by Dr. Katz, of silver permanganate laid on a zinc oxide carrier. This agent is unaffected by water vapour in the air being tested, so that drying agents are not needed. Such agents normally lose their effectiveness fairly quickly.

The effect of the new equipment is to change the carbon monoxide into carbon dioxide. The heat generated in the process is transformed into electrical potential and measured in terms of millivolts. Measurement of the electric potential is stated to give an accurate record of the amount of CO which is recorded by a simple calibrated gauge on the front of the detector.

The Katz-Katzman portable carbon monoxide detector is stated to be able to measure CO contamination as small as 3/2000 of 1 per cent.

The instrument takes up only a few feet of space. Included in the make-up is a small cell containing the chemical, the calibrated millivolt metre and a small battery-operated pump which propels the air into the detector.

Final improvements are being made to the detector, and it is expected that the right to manufacture the instrument will soon be made commercially available.

Fertilisers in Spain

IN recent months the pages of *ION* have been much occupied with the subject of fertiliser manufacture in Spain. Further news on the subject is contained in the last issue to hand (March), describing the opening of the new factory of NICAS (Nitrates de Castilla, S.A.) in Vallodolid, by General Franco and Ministers. The capacity will be 32,000 tons in the first stage and 64,000 tons per annum in the second. It is stated that the first stage will begin within a short time.

This new enterprise has been capitalised at 100 million pesetas. Electrolytic hydrogen is to be used with atmospheric nitrogen from air liquefaction, by the known methods which are described, also for the synthesis of ammonia, nitric acid, and ammonium nitrate. This latter will be mixed with calcium carbonate, and the nitrogen content will be 15.5 per cent.

The Future of Analytical Chemistry

Instruments and Training for Industry

by CECIL L. WILSON, M.Sc., Ph.D., F.R.I.C.

WITH increasing frequency, analytical chemists are asking themselves questions regarding the future trends of their branch of science. Relegated for many years to the rôle of a rather unimportant handmaiden, analytical chemistry was almost static and little thought of, except by the faithful few.

The last ten years have seen a dramatic upheaval, and one which is clearly still in progress. This has resulted in an urgent demand for many more analytical chemists than the various sources of supply are likely to be able to provide for some time to come.

Because of the sudden demand, and of the uncertainty as to the way in which analytical methods are likely to develop, the sources of supply are themselves perplexed regarding what they are required to supply, while those on the receiving end are in large part dissatisfied with what is delivered to them.

Although the phase of development is still continuing, and leaders in the field may have divergent views on many aspects of the eventual issue, certain fundamental principles are emerging, and have been stated in varying terms by a number of writers and speakers on this topic on both sides of the Atlantic.

Instrumental Methods

When one examines recent trends, it is clear that one of the major factors, perhaps the most important one, is the place of instrumental methods of analysis in the industrial laboratory, and hence in analytical training. It was very fortunate that the pressing need for the increased help of analytical chemistry during and since the war years should have been almost contemporary with, or, indeed, slightly preceded by an equivalent expansion in the application of instruments to analytical problems.

The few isolated but notable examples of important advances in analytical chemistry in the 10 to 15 years prior to the last war almost all resulted from the introduction of instrumental techniques; polarography and various forms of electrometric titrations spring particularly to mind. These advances undoubtedly not only served in their own spheres, but performed a wider function in making the analytical chemist instrument conscious. To this new attitude of mind must be attributed, in considerable part, the two lines along which instrumentation developed in the analytical laboratory.

In the first place, there was a marked increase in the applications of instruments which were already familiar to the analytical chemist: the spectograph, for example, came to the fore as a general analytical instrument rather than, as hitherto, the weapon of a few specialists.

Measuring Physical Properties

As a second line, and one which was rather more bewildering, there was the development of new instruments, or, more precisely, the application of instruments which were already valuable for other purposes to analytical processes; electron microscopy, X-ray methods and mass spectographic analysis may be classed in this category. In other words, the analytical chemist was made fully and clearly aware that the measurement of any physical property, and not merely the measurement of mass or volume, might be a function required of his department. It is probable that this general statement of the scope of the analytical chemist's work was only rarely appreciated ten years ago.

Because of this development of instrumental methods, it is no surprise to find that in the recent valuable reviews published in *Analytical Chemistry*[1], such methods of analysis take up at least half of the space allotted to the survey of the whole field of modern analytical chemistry. It is equally pertinent to the discussion to comment that any higher training of chemists which omits to introduce its students to quite a range of these techniques is consequently failing in its duty.

These developments constitute some of the factors which lead the analytical chemist to look critically at the future. With inevitable over-enthusiasm, some have taken the view that instrumental methods must sweep the field. A fairly recent report of a symposium on analytical chemistry[2] is illustrative of this point of view. The symposium, it was stated, was a “graphic demonstration of the progressive spirit of the modern analytical chemist, and pointed at the radical changes that have been made in methods of analysis during the past ten years. There was not a single mention of a burette or a crucible in the entire programme. The procedures described were rather characterised by one speaker's jesting comment that 'after all, one just has to have some electronic mechanism in an apparatus these days.'"

This is indeed an unfortunate view to publicise, for it is a half-adherence to this attitude that is responsible for most of the confusion that has arisen in the minds both of those training and those requiring analytical chemists. If, as a hasty and ill-founded survey may suggest, the classical methods are out-moded, and the practice of analytical chemistry is to be conditioned by a collaboration between electronics engineers and a team of button-pushers who need only be trained in the tricks of pushing their own particular buttons, then analytical chemistry might well be superannuated, and disappear from the chemical curriculum.

Modern Advances

Fortunately, the saner view has been explicitly stated by many in authority, and it is reasurring to find that if, in the most recent of the *Analytical Chemistry* surveys, half of the space is devoted to instrumental methods, the remaining half is concerned with modern advances which cannot strictly be called instrumental. It is clear that while the analytical chemist has become instrument conscious, he has also become aware that there are other ways in which he may achieve both fundamental and applied advances.

The sections devoted to inorganic volumetric and gravimetric analysis, and to inorganic micro-analysis, are among the largest in the reviews, and indicate that a very large bulk of research on what may nowadays be called classical methods still continues to appear.

In addition, and this is an interesting and encouraging phenomenon, there are several techniques, not necessarily instrumental, which have been applied successfully to a growing number of problems. Outstanding among these is chromatography, with its well-known successes, and to this must be added its offspring, paper chromatography which, in the past few years, has come to the fore as a technique widely applicable to both inorganic and organic problems. Again, ion exchange methods are increasingly common, and indicate the receptivity of the analytical chemist to new ideas as well as to new instruments.

It would be unduly pessimistic to assume that analytical chemists have reached anything like the bottom of the bag in respect of non-instrumental techniques. Writing on instrumentation, Müller[3] says: "The advances in instrumentation continue to be derived from every branch of science and technology, and they all hold promise for the solution of the analyst's problems. It is particularly profitable to seek suggestions for new analytical techniques in wholly unrelated fields, and this is possible especially if one examines new developments in the light of their instrumental possibilities."

While Müller directs his thesis to an instrumental context, it should be stressed that the statement is equally applicable to non-instrumental methods. It is probably easier to recognise the potentialities of an instrument than those of a non-instrumental process. But the rapid development of partition chromatography, particularly in separations on paper, should be a clear reminder that the dodge of to-day may be the technique of to-morrow, if it is spotted by a worker with insight.

If we take this view, it is then possible to hold with Murphy[4] that while "we may rejoice that recognition by analysts of the latent possibilities of instrumentation has brought about a renaissance in analytical chemistry . . . I do not believe, however, that the classical methods will be abandoned . . . instrumentation will not supplant, but will rather supplement, wet methods." This being so, it may then be possible to crystallise certain views regarding the future of analytical chemistry which will be some guide to the attitude which must condition our approach more immediately.

An Educational Problem

In the first place, we must accept the fact that instrumental methods of analysis are here to stay. They are of importance, and every analytical chemist, no matter how much he may have nostalgic leanings towards classical methods, must learn to make the best use of the instruments available. The primary problem which this raises is an educational one, and on this various pertinent statements have recently been made.

Most of the analytical chemists of tomorrow will work in the industrial field. While certain fundamentals will hold for all of these, their attitude to analytical problems, and their opportunity for variety of approach, will depend to a considerable extent on the apparatus which the budget of their firm can make available to them.

Certain instruments are, or must shortly become, a part of the standard equipment of every analytical laboratory. The polarograph and the photoelectric absorptiometer, for example, are so widely used, and have such potential value for most branches, that one must regard them as falling within this category.

On the other hand, it would be a mistake to suppose, as some have done, that each analytical laboratory must have every analytical instrument available. Both the direct cost of the instrument and, in many cases, the necessity for specialist staff, must preclude this. Many laboratories will never require a mass spectrograph, and may well be able to solve their problems satisfactorily and expeditiously without recourse to X-ray methods of analysis. The nature of the problems met with most frequently must determine the need for the more expensive instruments of this type.

It would, equally, be false economy for laboratories carrying out certain types of analysis daily to decide against equipping themselves with elaborate spectrographic equipment on the grounds of initial or running cost. J. R. Churchill has stated[5] that 80 per cent of his company's metallurgical analysis is now done by spectrographic methods, the time factor being correspondingly reduced. Again, many laboratories find that not only is X-ray analysis the easiest answer to certain of their requirements, but it is additionally valuable in providing them with information which they would otherwise miss.

Range of Apparatus

One must conclude, therefore, that while the range of apparatus in the analytical laboratory will increase appreciable in the fairly near future, it will do so selectively. The attitude towards the extension will vary from laboratory to laboratory, and will be notably different in laboratories attached to small firms and those which serve large organisations.

This realisation enables one to look more realistically at the problem of teaching instrumental analysis. Any aspiring analytical chemist, during his training period, should become familiar with the principles and practical use of those instruments most likely to achieve the status of standard equipment. At the present time it might be difficult to set up an unexceptionable list of such apparatus. Without making any claim to infallibility, however, one might suggest that this would include the absorptiometer, the microscope, the polarograph, the refractometer, the spectrograph, together with a selection of instrumental methods for electrometric titrations and electrodeposition.

In addition, the principles of other more elaborate instrumental methods and their fields of application should be studied. It might even be advantageous if some slight knowledge of the practical aspects of at least one of these were acquired. In the meantime, the aspiring analytical chemist must never lose sight of the classical basis of analytical chemistry, with its equivalent importance. He must acquaint himself with the principle and practice of the newer non-instrumental techniques. He must have more than a nodding acquaintance with the development and trends of classical micro-analysis as distinct from analysis on the ordinary scale. Above all, he must have his mind made and kept alive to the possibility that on the morrow some chance observation of his, some random coincidence of apparatus or methods, may, if his mind is sufficiently receptive and fertile, add yet another tool to the armoury of analytical research.

Training Courses

Recently, in discussing the training of analytical chemists for industrial research, Stillmann[6] has outlined the requirements of a training course as he sees them, and some of his points may usefully be stressed by repetition here. The basic principle, he claims, and one which many writers have emphasised, is that the course should be based on the fundamental principles of chemistry and physics. Each part of the course, whether qualitative, quantitative, or instrumental analysis, should be chosen primarily to illustrate principles, to show why certain steps are taken, to avoid turning the student into a slave of procedural detail.

With particular reference to instrumental analysis, Stillmann maintains that "the emphasis should be on the principles of design and operation of the instruments and on the development of adequate interpretations of the data obtained from the instruments. The objective of a survey course should not be to develop a finished instrument operator. Such skill is easily attained with practice. Rather, the student should receive a clear impression of each type of instrument so that he knows its field of application together with some of its advantages and some of its disadvantages."

This emphasis on fundamentals rather than on details means that the production of first-rate analytical chemists of the future must be a matter of co-operation in a way that has not, in the past. always been achieved. As Stillmann says, "There should be no fore-ordained plan to turn out, at the end of four years, a complete analytical chemist. Rather there should be presented to the student the basic knowledge in the sciences of chemistry and physics upon which as foundation he can build later, either through graduate study or through actual experience in the laboratory while practising his profession."

Consequently, a co-operative industry will not expect that its intake should immediately be able to cope with industrial analytical research problems, perhaps in a specialised field. It is, however, fully entitled to expect that the basis on which the prospective analytical chemist can build should already have been supplied. This, often, is not so.

Necessary Qualifications

Too often the student training in analytical chemistry is of the cookery book type, with no regard to reasons. Solution A is added to solution B at a prescribed rate, conditions of temperature as laid down are closely adhered to, incineration and weighing follow the printed word precisely, and the student hands in a correct determination, which is worth exactly nothing apart from proving an ability to read a set of directions accurately and to follow them implicitly, which are the qualifications of a technician, and not of a research chemist.

More than in any other branch of chemistry, there has been in analytical training the disastrous tendency to box theory and practice in different compartments in the student's mind. Eynon, in his retiring address as president of the Society of Public Analysts[7], put his finger on one of the reasons for this, and one of the necessities if it is to be rectified, when he called for longer periods of training for analytical chemists and for the establishment of chairs in this branch.

Only when the subject takes its place as an equivalent partner with physical, inorganic and organic chemistry will it be fully realised by both partners in the co-operation, the training institutions and the industrial employers, that analytical chemists cannot be mass-produced from semi-skilled raw material.

The editor of *Analytical Chemistry* has made statements[8] which show that in America these problems are realised with equal force.

As far as this country is concerned, it is fortunately the case that since the war the financial aspect is the least pressing, owing to the important support being given by the Government to the universities, but the need for staff able to integrate fundamental analytical training in a comprehensive undergraduate course is acute.

The lack of a general appreciation that analytical chemistry must be developed in the universities to a pitch far beyond any yet achieved is still woefully obvious. It must be clearly realised that the staff involved are primarily concerned with the fundamentals of analytical chemistry in a broad training course, and are not inorganic or physical or organic chemists who are prepared to mention analytical problems in passing. On the other hand, they are concerned to indicate to the student that analytical problems in turn are interlinked with all the others.

In this way, by the time the student has acquired a degree or an equivalent qualification, and only then, is he in a position to decide that he will specialise in analytical chemistry, if he prefers it to physical chemistry or organic chemistry. It is as necessary that the physical or organic chemist-to-be should have some appreciation of analytical chemistry as that the analytical chemist be familiar with the background of those who should be his collaborators. From that point, specialisation, met by provision of post-graduate courses in analytical chemistry and by post-graduate schools, will follow.

A Long-Term Proposition

The need for correlation between industry and training establishments will thus be seen to be a matter for both sides. The training establishments must realise clearly what is required, and must set themselves to a reorganisation which will enable the demand to be met. Industrial organisations, for their part, must be prepared to explain precisely what they require. They must, if necessary, be prepared to assist in its provision, both by financial support, and, quite frequently, by the provision of staff who are alive to the requirements by experience, and who are first rate teachers. Finally, they must patiently avoid expecting an immediate return in what is essentially a long-term re-orientation of the universities and higher technical colleges to the place of analytical chemistry in the training of a chemist, and the function of the analytical chemist in chemical industry to-day.

REFERENCES

[1] *Anal. Chem.*, 1949, *21*, 2, 1950, *22*, 2.
[2] *Chem. and Eng. News*, 1948, *26*, 993.
[3] *Anal. Chem.*, 1950, *22*, 72.
[4] *Chem. and Eng. News*, 1950, *28*, 544.
[5] *Chem. and Eng. News*, 1948, *26*, 453.
[6] *J. Chem. Educ.*, 1950, *27*, 147.
[7] *Analyst*, 1949, *74*, 163.
[8] *Chem. and Eng. News*, 1950, *28*, 544.

HEPTAFLUOROBUTYRIC ACID

A Likely Intermediate in Fluorine Chemistry

By A SPECIAL CORRESPONDENT

A GOOD deal of research has recently been carried out on the fluorination of aliphatic acids, and one of the latest of the completely fluorinated reactive acids is heptafluorobutyric acid (CF_3 CF_2 CF_2 COOH). This is a very strong and highly corrosive acid possessing a sharp odour very similar to that of butyric acid. It is a colourless, fairly heavy liquid (density g/cc. 1.641 at 25° C.) having a boiling point 120.0° C. (735 mm.) and freezing point −17.5° C.

The vapour pressure of the fluorinated acid is 44 mm. at 56° C. : 455 mm. at 107.4° C. and 735 mm. at 120° C. : surface tension is 15.8 dynes/cm. (30° C.). It is miscible with water, methanol, acetone, ether and petroleum ether, slightly soluble in xylene and heptane, and very soluble in carbon tetrachloride and benzene.

So far no major application has yet been found for heptafluorobutyric acid, but it is expected that it will find its greatest outlet as an intermediate in the new fluorine chemistry. Work carried out in the U.S.A.—notably by the Minnesota Mining and Manufacturing Company—indicates that owing to the low surface tension of the acid, and therefore its high penetrating power, there is a possibility of utilising it for introducing the hydrophobic heptafluoropropyl group into organic molecules, and so preparing a very wide range of fluorinated compounds.

The Esters

A number of esters can be prepared from the fluorinated acid. The simplest, methyl heptafluorobutyrate, has a boiling point of 79° C. (737 mm.) and a melting point −86° C., and the most complex, 1-3- Bis (heptafluoro-butyroxy) - 2 - ethyl-hexane, a boiling point of 145 (35 mm.). The polymerisable ester, vinyl heptafluorobutyrate, which is obtained by the catalysed addition of heptafluorobutyric acid to acetylene, has a boiling point of 79° C. (748 mm.).

Some of these esters are prepared in good yield, for example, ethyl heptafluorobutyrate can be obtained in 83 per cent yield (crude) by reacting with ethyl alcohol in the presence of hydrochloric acid, and the methyl ester in 89 per cent yield by reaction of the acid with an excess of methanol in the presence of sulphuric acid.

All the usual derivatives of aliphatic acids can be prepared from heptafluorobutyric acid, and some appear to have interesting commercial possibilities. The alcohol, 1, 1-dihydro-heptafluorobutyl, formed by reduction of heptafluorobutyric acid or its derivatives, is comparable with phenol in acidity and resists conversion to an alkyl halide. It can be esterified under conditions used for a phenol. The alcohol has a boiling point (750 mm.) of 95° C. Esters can be prepared from this alcohol and the acrylate is of particular interest for the manufacture of fluorinated acrylic resins. The acrylate derivative has a boiling point of 43° C. (40 mm.).

Amines

A fluorinated amine, 1, 1-dihydroheptafluorobutylamine, can be prepared from heptafluorobutyronitrile and heptafluorobutyramide by the reductive action of lithium aluminium hydride. The amine has a boiling point of 68° C. (743 mm.) and bears a closer resemblance to aromatic than to aliphatic hydrocarbon analogs. It is a relatively weak base. The amine hydrochloride has a melting point of 130-135° C., at which temperature it sublimes.

Diazotisation in a dichloroethyl ether-water system at low temperature has been accomplished. The derivative bis (1, 1-dihydroheptafluoro-butyl) urea has a melting point 118-9. By utilising the Grignard reaction it is possible to obtain the olefin, 2-heptafluoro-propylpropene, from the ester, methyl heptafluorobutyrate, by first reacting with methyl magnesium iodide to obtain the carbinol and then dehydrating this to make the olefin. This has a boiling point 53.6° C. (733 mm.). The compound 1, heptafluoro-propylethanol can be prepared by subjecting heptafluorobutyraldehyde to the action of methyl magnesium iodide.

Heptafluorobutyric acid forms a number of metallic salts, the most interesting being those of lead, silver, calcium, lithium and sodium. These are all very soluble in water and in several organic solvents. Lead heptafluorobutyrate is soluble to the extent of 493 grm. in 100 grm.of water and the lithium salt, 403 grm. in 100 grm. water.

The acid is difficult to handle, being highly corrosive to the skin, highly toxic and very corrosive to metals.

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Metallurgical Section

6 May 1950

GROWING FIELD OF RESISTANT METAL

Commercial Review of Technical and Economic Facts

LIGHT on the widening uses of the primary metals, wrought and cast products and alloys, has been provided by the International Nickel Company of Canada, Ltd.

This expert and far ranging review of many of the factors which have influenced the metal markets and metal-using processes in the past year was given by the company chairman, Mr. Robert C. Stanley, at the I.N.C. annual meeting in Toronto last week. He dealt at length with current operations concerning nickel, monel and the precious and semi-precious metals which enter largely into chemical processes and metallurgy, with which the group's plants in Britain, Canada and the U.S.A. have been principally concerned.

Since last July all separation of nickel and copper by the I.N.C. has been carried out by the matte flotation process, in preference to the Orford process.

Nickel is now being used in more than 3000 ferrous and non-ferrous alloys to impart one or more of its characteristics to them. The percentage of nickel in the alloys ranges from 99.7 per cent in malleable nickel to 0.20 per cent in a hardenable silver alloy.

Nickel Applications

Nickel thus finds its ways into a very great number of industrial applications. In the United States, Canada, and Great Britain the steel mills take approximately a third of the total, including substantial amounts for stainless steels. Deliveries of high nickel content rolling mill products and nickel for electro-plating together account for about 40 per cent.

Somewhat smaller percentages are used for grey iron, steel and non-ferrous castings, heat and electrical resistance alloys, nickel silver and cupro-nickel, magnets, batteries, chemical products, coinage, and other miscellaneous alloys.

At a time when there is great interest in cobalt for products such as alloys for jet engines, medicinal, and other applications, the cobalt recovery at Port Colborne, Ontario, is being increased. The cobalt is sold principally overseas either as oxide or as salts, produced by the Clydach refinery in Wales.

The extension of television service and reorganisation of telephone systems on the Continent are providing opportunities for the further application of appropriate grades of iron powder.

The company continues to be an important producer of platinum metals, supplying world markets with platinum, palladium, rhodium, ruthenium, and irridium, which are recovered as by-products of nickel and copper refining.

Platinum Values

The markets for platinum metals are principally in the United States, where approximately half of all the platinum metals are used for chemical and electrical purposes. In these industrial services, the platinum metals have demonstrated economic advantages, the high initial cost being largely offset by a high value in the form of scrap.

The European market for platinum metals has grown with post-war reconstruction. Consumption has increased especially in the dental, electrical, and chemical fields. In 1949, manufacturers of dental alloys greatly increased their consumption of palladium.

The United States and Canadian production of alloy steels, other than stainless, was somewhat lower in 1949 than during the preceding year, but no significant changes were observed in the metallurgical pattern of these steels. More than 40 per cent of the total tonnage was estimated to have contained nickel.

Steels containing varying percentages of nickel continue to find wide use in motor vehicle, locomotive and many other engineering processes.

Progress has been made in engineering by specifying the use of 8½ per cent nickel steel for service at liquid air temperatures and several pressure vessels have been made and installed in commercial plants.

The prospect of increased use of commercial oxygen in large volumes in the metallurgical and petrochemical industries indicates a continuing demand for this steel which gives high strength and great toughness at these frigid temperatures.

The character of the stainless steel markets has remained much the same during recent years and important outlets included the chemical, petroleum, and food processing industries, transportation equipment, and the home appliance fields.

However, new uses are found each year and one of general interest during the year was the completion at Schenectady, New York, of a building with stainless steel walls. An extension of this field of application may provide additional outlets for the popular 18-8 chromium-nickel types.

The nickel plating industry ranks third as a user of nickel. The automotive industry accounts for the largest consumption of nickel for plating purposes.

Atmospheric Conditions

Long-time atmospheric corrosion tests are being completed which demonstrate the advantages of heavy coatings of nickel on steel to resist a wide variety of atmospheric conditions encountered by motor vehicles.

In the field of alloy cast irons, an upward trend of use was observed in speciality products such as Ni-Hard in mining equipment. Performance to date suggests that additional markets will be acquired with the expansion of operations in the beneficiation of iron ores. Following successful trials, Ni-Hard is being increasingly adopted for mill liners, grinding balls, etc., in the cement industry in Great Britain and elsewhere abroad. Particularly successful results have been obtained in India.

Demand for nickel for the corrosion-resisting cast irons remained at satisfactory levels. The aircraft industry uses substantial quantities of nickel in engineering and stainless steels, in heat-resisting alloys, such as Nimonic 75 and Inconel, mostly in sheet for combustion chamber liners and exhaust pipes, and other Nimonic alloys and Inconel X for highly stressed parts operating at elevated temperatures.

An example of the extent to which nickel-containing materials are employed in modern ship construction was afforded by the Peninsular and Oriental S. N. Company's 28,000-ton twin-screw passenger liner *Himalaya*, the largest vessel in the P. & O. Line's fleet. Monel and high nickel content heat-resisting steel were used for turbine blading. The latter material was also used for nozzle vanes, and gear pinions were made of nickel steel. Cupro-nickel was used for condenser and oil cooler tubes, and substantial amounts of nickel silver were employed for ornamental and structural fittings.

Since 1881, in which year Switzerland had the distinction of issuing the first coin to be made of pure nickel, 42 countries have used pure nickel for 124 different coins. During 1949 Burma decided to employ pure nickel for the half and quarter rupee coins, the blanks for which were supplied by the I.N.C. British subsidiary, Henry Wiggin & Co., Ltd.

India has continued the issue of coinage in pure nickel and cupro-nickel, and during the past four years over 1000 million coin blanks have been produced for striking in India. The issue of the new coinage will not be completed for some years and will involve altogether many thousands of tons of nickel.

Television is using larger quantities of rolled nickel, with indications that the amount will continue to increase. Pure nickel is being used for the cathodes of the camara and picture tubes of television equipment due to its ability to retain its strength and stiffness at high temperatures (1650° F.) and also because it serves as an excellent base for the oxide coating which gives off the electrons.

In addition, the small amplifier tubes used in television transmitting and receiving equipment employ pure nickel cathodes, nickel or nickel plated anodes, and nickel grids and lead wires.

Lead Deposits in Derbyshire

A FURTHER rise in the price of lead announced last week gave additional interest to the report of Derbyshire Stone, Ltd., which, owing largely to the increased cost of lead during the last 10 years, is examining the prospects of developing large-scale working of lead-deposits in Derbyshire (THE CHEMICAL AGE, *62*, 530).

The company's chairman, Mr. John Hadfield, told the general meeting of the company last week that the area available to them had recently been extended sufficiently to make it worth while to carry out extensive investigations of the quantities of lead ore which might lie there. Modern methods developed would reduce the difficulties resulting from depth and water.

An immediate examination aided by geophysical methods and boring was to be carried out by the Johannesburg Consolidated Investment Co., Ltd., in association with Derbyshire Stone, Ltd.

If results indicated that there were satisfactory quantities of lead ore, a company would be formed in which both parties would be substantially interested.

THALLIUM: A NEGLECTED ELEMENT

Some Increase of Industrial Applications

THALLIUM is one of the rare and relatively neglected elements that has recently assumed conspicuous importance. It is widely distributed in nature but occurs in such minute quantities in most rocks and minerals that its recovery at present is commercially feasible only as a by-product —in the form of its chloride in the flue dust—of other industries.

The unprecedented demand for products having special or unusual properties, created during the war, led to a study of a number of the rarer elements that previously had been given comparatively little attention because of the limited knowledge of properties, the small quantities present in available raw materials or the high cost of concentration and recovery.

The U.S. Bureau of Mines reports that it is studying the properties of such elements in greater detail, locating the most promising raw materials from which they can be derived, and working out methods of extraction that will render the recovery of the elements more economical. The last of the series dealt with titanium (THE CHEMICAL AGE, 62, 473). The new Information Circular 7553 is devoted to thallium.

Discovered by Crookes and Lamy in 1861, thallium's physical and chemical properties have been studied by several investigators, and although there was for a time some disagreement among them concerning the properties of the element and its compounds, these are now fairly well established and accepted.

Malleability

Thallium (Tl; a.w. 204.39; s.g. 11.85; m.p. 303.5° C.) is a heavy, soft, bluish-white metal resembling lead. In pure form it is quite malleable, but, although it can be extended, it is not very ductile and hence cannot readily be drawn into wire. It has a specific gravity close to that of lead and melts almost at the same temperature, but its boiling point is fully 125° C. higher than that of the latter metal.

Thallium may be distilled in an atmosphere of hydrogen or other reducing gas. It has a crystalline structure, and when bent gives off a sound similar to the "cry" of tin. Its hardness compared to that of lead at 1.5 is about 1.2.

It amalgamates with mercury and forms alloys with many metals. Lead-thallium alloys have a higher melting point than that of either metal alone. Alloyed with silver or lead thallium greatly increases the corrosion resistance of these metals.

Although thallium resembles lead in many of its physical properties, it is more closely related to the alkali metals in its chemical properties and it is now generally agreed that it should be placed in Group III of the periodic table, along with boron, aluminium, and some "rare" elements.

Having a valence of 1 and 3 it forms both thallous and thallic compounds. The thallous salts are the more stable and have been studied more closely than the thallic compounds.

The Oxides

Oxidation of thallium in the air results in the formation of yellow thallous oxide (Tl_2O); but under more highly oxidising conditions, the dark-brown or violet thallic oxide (Tl_2O_3) is produced.

Thallium combines directly with the halogens, forming three series of compounds. In the case of fluorine, the action is so violent that the temperature of the product is raised to incandescence. In its monovalent state, thallium resembles silver and mercury, since it forms a relatively insoluble bromide or chloride and is precipitated by hydrogen sulphide. The sulphide, however, while very slightly soluble in water and alkaline solutions, is dissolved by dilute sulphuric acid.

Thallous hydroxide, carbonate, and sulphate resemble the corresponding compounds of soda and potash, since they dissolve quite readily in water.

On the other hand, thallium sulphate is readily reduced to metal by means of zinc and is far more stable than the alkali metals. Trivalent thallium compounds are more analogous with those of the aluminium family.

The comparative scarcity of thallium, the limited knowledge of its properties, and the high cost of extracting it from known sources hindered its commercial development.

Hence for approximately 34 years thallium continued to be more or less of a laboratory curiosity with few, if any, industrial applications. Its use in medicine began in 1896, but on account of its great toxicity was abandoned. Later, the use in highly refractive optical glass was proposed, which for a while represented the most important outlet.

(continued overleaf)

Several new uses were developed, particularly as a poison for rodents and later as an insecticide, and these have expanded rapidly within the past decade. Even at the present rather high prices thallium and its compounds can be employed to advantage for a number of commercial as well as scientific and military applications.

In conjunction with other metals, thallium forms alloys that have unique and valuable properties. Examples are lead-thallium, silver-thallium, and many ternary alloys. By far the largest proportion is consumed in compounds, for lenses, and photoelectric cells; in the glass industry to impart dark, opaque, black or brown colours as well as to increase density and provide an index of refraction higher than that of lead glass.

One of the more recent applications is in the manufacture of incandescent lamps. Thallous salts, being more stable than thallic compounds, absorb traces of oxygen in such lamps and hence prolong the life of the tungsten filament.

Sources of thallium can be broadly divided into two groups: first natural occurrences, including deposits of thallium minerals, rocks containing small proportions of such minerals and water or brine with traces of dissolved thallium compounds. The secondary sources are industrial wastes and residues derived from metallurgical and chemical processes in which thallium from the original raw materials has been somewhat concentrated.

Since there are no commercial ores of thallium, the possibilities of extracting it as a primary product are extremely remote. However, in metallurgical and chemical operations designed to recover other metals and chemical products, thallium is often concentrated in flue dusts, precipitators, residues and mother liquors.

Production and Stocks of Non-Ferrous Metals

CLOSING stocks of non-ferrous metals in March were at a considerably higher level than in the same month of last year, and there was a marked increase in production, except in the gross output of main copper, alloy and products.

Consumption was also generally higher than in March 1949, and than in the previous month of this year. The monthly figures supplied by the British Bureau of Non-Ferrous Metal statistics give, among others, the following details:—

UNWROUGHT COPPER

	Long Tons Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers' ...	33,348	85,969
Imports	10,648	16,049
PRODUCTION:		
Primary	—	9,305
Secondary	2,340*	6,275
CONSUMPTION:		
Primary	9,416	29,200
Secondary	—	17,246
Exports	2,473†	35
CLOSING STOCKS:		
Govt. and consumers'	34,663	81,219

* Rough Copper.

† Includes 1,336 tons of rough copper despatched to Belgium and 1,137 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	26.099	,, ,,
Alloyed copper products	28,998	,, ,,
Copper sulphate	4,821	,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	33,258	48,210
Imports	4,764	9.495
PRODUCTION:		
Virgin and remelted ...	—	7,097
CONSUMPTION:		
Virgin (incl. debased) ...	8,779	21,738
Remelted and scrap ...	—	8,538*
Exports and Re-export	—	16
CLOSING STOCKS:		
Govt. and consumers'	29,243	45,136

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	59,707	4,416	—
Other stocks ...	85	—	—	—
IMPORTS	—	13,567	—	166
PRODUCTION ...	279	—	8,156	—
CONSUMPTION ...	256	13,160	7,152	8,158
Exports	—	42	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	59,169	5,420	—
Other stocks ...	108	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,356
IMPORTS	1,082*
PRODUCTION	—
CONSUMPTION	2,140
EXPORTS AND RE-EXPORTS	681

* From January, 1950, includes imports of soft solder; if any.

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	363
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	349

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	44.90

MINERALS OF THE BELGIAN CONGO

High Production of Uranium, Cobalt and Tar

THE great variety of metals and minerals produced in the Belgian Congo and the Belgian mandated territory of Ruanda-Urundi, some of them in large quantities, includes copper, tin, zinc, cobalt, uranium, silver, tantalum, wolfram, cadmium, lead, manganese, tungsten, bismuth and platinum, besides gold and diamonds.

Stated to be the greatest producers in the world of uranium, cobalt and industrial diamonds, these territories also come high on the list of producers of copper, gold, tin and a number of other metals. A review of the commercial conditions of the Belgian Congo (HMSO 1s.) states that copper is the greatest single item in value in the list of Congolese exports (Fr. 3000 million in round figures in 1948).

The presence of all these mineral resources has been the main factor in the economic development of the country in the past and has contributed more than anything else to the Congo's rapid rise to prosperity. Not only do the mineral deposits provide in themselves wealth such as does not usually fall to the lot of a new, undeveloped and thinly-populated country situated, for the most part, at an enormous distance from the sea, but their exploitation has brought inestimable benefits in its train.

Location

Mining and mineral production is carried on principally in the high altitudes of the eastern and south-eastern regions, the great central region of forests and rivers having hitherto kept inviolate, with one exception, the secrets of any subsoil riches it may possess; the exception however, is important, namely, diamonds in the basin of the Kasai river and its affluents. Mining is, naturally, entirely in the hands of big companies, the most important of which are: Union Minière du Haut Katanga (copper, cobalt, gold, tin, uranium), Société Forestière et Minière (diamonds and gold); Compagnie Géologique et Minière (tin); Société des Recherches Minières du Sud Katanga (manganese); Société des Mines d'Or de Kilo-Moto (gold); Compagnie Minière des Grands Lacs Africains (gold).

The following tables give the production figures for the years 1946, 1947 and 1948 for the Congo and Ruanda-Urundi:

		1946	1947	1948
Copper ...	Tons	143,885	150,840	155,481
Cassiterite ...	,,	24,095	15,553	16,228
Tantalum ...	,,	163	139	141
Wolfram ...	,,	241	12	15
Tin (metal) ...	,,	2,410	3,125	3,937
Coal	,,	101,901	102,074	117,494
Cobalt alloys ...	,,	2,528	6,697	6,397
Cobalt (granulated)	,,	1,171	878	1,741
Raw zinc concentrates ...	,,	67,024	46,495	54,501
Calcined zinc concentrates	,,	21,761	25,895	27,892
Cadmium ...	Kgs.	16,571	26,040	18,056
Lead ore ...	Tons	—	1,675	1,002
Silver	,,	157	126	118
Manganese ore	,,	—	8,519	12,765
Bismuth ore ...	Kgs.	—	1,040	652
Pig iron ...	Tons	—	406	141

A comparatively advanced stage of industrial development is indicated by the figures of Congolese production of chemicals (43,882 tons in 1947 and 47,243 tons in 1948) and compressed oxygen (285,466 cu. m. in 1947, 347,675 cu. m. in 1948). The principal manufacturing firms concerned are: chemicals (Ciments du Congo, Thysville, and Société Industrielle et Chimique du Katanga, Jadotville), and compressed oxygen (Chanic, Leopoldville).

1950 Aluminium Supplies

THE Ministry of Supply announces that it has contracted to buy 96,000 metric tons of virgin aluminium from Aluminium, Ltd., of Canada, during 1950. Total imports of virgin aluminium from Canada during 1950 are expected to reach about 136,000 tons, comprising 96,000 tons from the new contract and about 40,000 tons under the 1949 contract. In 1949, when 161,000 tons were imported from Canada, stocks rose above the level considered necessary. During 1950 stocks will be reduced to the required level. These imports from Canada, together with aluminium from European and home production, will, it is stated, provide an adequate supply for the U.K. fabricating industry, which in 1949 used 181,500 tons; 300,000 tons of Canadian aluminium has been purchased by the U.K. with ECA aid.

Saar Iron and Steel

Pig iron output in the Saar in 1949 totalled 1,581,000 tons (1,134,000 in 1948); crude steel production amounted to 1,758,000 tons (1,122,000 tons), and rolled products 1,216,000 tons (819,000 tons).

Sources of Metal Corrosion

Association's Work on Copper, Aluminium and Alloys

THE prospect of considerable advances in knowledge of the causes and behaviour of metal corrosion are recalled in the current summarised accounts of the work of the British Non-Ferrous Metals Research Association. Much of its work in corrosion research during 1949 was concerned with the destructive reactions observed in copper, copper-nickel-iron alloys and aluminium.

Resistance to Pitting

Referring to these in its 30th annual report, the association confirms the belief that the resistance of copper to pitting in the presence of some domestic waters is probably due to a naturally occurring inhibitor in such waters.

An "artificial pit" has been devised in which a corrosion current flows when the liquid is a supply water known to be capable of causing pitting, while none flows when the liquid in the cell is a water known to be non-corrosive. The results of such experiments show a remarkably close correlation with the results of polarographic examination of the waters. It is therefore now possible to assess the likelihood of a given water being capable of maintaining pitting with much greater assurance than hitherto.

It is now becoming clear that the most important reason for the commencement of pitting in practice is the presence of a suitable cathodic film on the pipe surface, before the pipe is installed. Evidence has been obtained that such films only occur when certain manufacturing techniques are used, but their presence has been confirmed in 90 per cent of the failures brought to the association's notice.

It would seem that failure in cold water would be virtually eliminated if only clean tubes, free from cathodic films, were put into service and that this factor is far more important than the composition of the tubes.

The complicated nature of the current work on resistance to impingement of copper-nickel-iron (5-10 per cent nickel) has been disclosed by the association's experiments with standard condenser tube alloys. These have been subjected to jet impingement with water speeds up to 35 ft./sec., with up to 5 per cent of entrapped air. Practical recommendations have been produced regarding the effect when such tubes are re-heated to 600° C. Such heating, it is established, does not significantly reduce subsequent resistance to corrosion. The impingement experiments appear not yet to have produced any conclusive results, although certain trends are said to have been recognised. Attention is being paid now to the possibility of producing new alloys with heightened resistance to high water speeds.

Water Supply Effects

The association's corrosion studies of aluminium have already made it apparent that the presence in the water of traces of copper has a profound effect on the behaviour of the test pieces. In all cases corrosion attack is extremely localised. Part of this present programme is the comparison of the effect on commercial grade aluminium of differing natural water supplies. In members' laboratories tests are being carried out, using some six types of water of widely differing characteristics.

Pig-Iron International Scheme

TECHNOLOGISTS in chemistry, metallurgy, gas and from the oxygen producing industry forming a group from OEEC countries have been meeting to arrange the pooling of information and resources. A proposal was made to erect on an international basis a large pilot plant of new design to produce pig-iron and to develop the use of low-cost oxygen produced on a large scale.

Plans include iron and steel production, mining by gasification, and production of synthetic petrol, alcohol, and intermediates for other synthetics.

Jugoslav Copper Mining

INTENSIVE exploratory and expansion work is being carried out in the copper and pyrites mines of Majdanpek in Eastern Serbia, according to Jugoslavian reports. Recent prospecting is said to have shown that these mines, which were thought to be nearly exhausted, may eventually prove more important than the well-known Bor copper mines. Construction of a flotation plant is to be put in hand this year, to be linked with the mine by a standard gauge track, and electric power supplied from the Kostolac power plant.

ALUMINIUM DEVELOPMENT

Retarding Effect of Devaluation

CERTAIN major developments, which were to have been included in the 1949 activities of the Aluminium Development Association. have been in part suspended or delayed by the effect of devaluation. especially the rise in the price of imported material.

Although fruition of some of these projects may be retarded until the situation becomes more stabilised, this has not occasioned any slackening of the association's fundamental development work. These were among the facts offered by Mr. Kenneth Hall, the retiring president, at the annual general meeting, recently. In fact, he said, the interval was being profitably employed in achieving solutions to hitherto unsolved problems, such as riveting and welding of thick plate, or the fuller introduction of new techniques such as argon arc welding.

In research, the essential study of welding and joining, particularly as applied to argon arc welding and work on thick plate, continued to be pressed forward, and it would be noted that in riveting some success had been achieved with rivets up to ⅞-in. diameter.

Thin Copper Foil

AS a preliminary to commencing production in a new plant, it is announced by the Royal Mint Refinery, of 19 Royal Mint Street, London, E.1, that limited supplies of very thin copper foil are available from a pilot plant. This foil extends the range of commercially available copper down to 0.00012 in. in thickness.

At present the foil is supplied in sheets 30 in. by 5 in., but eventually it is expected that lengths of several hundred feet will be available in widths of 7¼ in. (18.5 cm.). The foil is of hard temper and is easily handled in spite of its thinness. Its electrical conductivity is 95 per cent I.A.C.S. minimum, and its chemical composition conforms to electrolytic copper standard. It is supplied with one side polished and may, if necessary, have one or both sides plated with gold, silver, nickel, zinc, cadmium or tin.

If required, light tested material free from pinholes can be made available in certain cases. It is expected that the advent of this material will open up new possibilities in many industries, particularly those dealing with the manufacture of printed circuits and electrical condensers.

SPAIN'S ALUMINIUM

Difficulty in Obtaining Machinery

THE importance of aluminium and its alloys has long been realised in Spain, and in recent years serious practical attempts have been made to establish a national industry in this field. On August 11, 1943, the Empresa Nacional del Aluminio, S.A., was established, with works near Valladolid. From an initial contemplated output of 1250 tons per annum it was proposed to increase to 2500, then to 5000-10,000 tons of aluminium. Many difficulties have hitherto delayed even partial realisation of these plans, including non-delivery of the requisite machinery ordered from Switzerland, inadequate electric power, currency troubles, etc., (ION, 1950 *10*, 139-142).

The site of the factory is near a number of electric power stations, and the importance of adequate (and alternative) power supply to keep the furnaces going continuously without risk of any cooling down is emphasised. The site is also fairly well situated as regards communications, being near the main Madrid-Irun railway and on the Madrid-Santander highway. The new enterprise has been financed by the Government through the Inst. Nac. de Industria—with majority participation —and the Soc. Española de Construcciones Electro-Mecánicas.

The process to be used is the generally known one, from bauxite by electrolysis. In the original article are shown the electrolytic plant with Söderberg carbon electrodes, gas recovery system, 5-ton furnaces for melting, series (6) of mercury vapour rectifiers 6-phase, 6250 amp., and general perspective view. Much of the plant is believed to have been supplied by the Swiss firm, Brown, Boveri Co. The rectifiers are Cooper-Hewitt type. The source of the bauxite employed is not stated.

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ACCOUNTS AND TAXATION

Ascertaining Taxable Profits of Chemical Processes

by S. HOWARD WITHEY, F.Com.A.

METHODS of account-keeping in the chemical and allied industries vary considerably, according to the nature of the products and the number and kind of processes employed. In addition to ordinary books of account—such as sales books, purchase journals, nominal and private ledgers, etc.—certain aspects of accountancy now have to be emphasised in order to ensure an effective internal check and control and to enable the management to ascertain the total cost of running the business.

Advertising

Demands for chemical products of standard and special design are reflected in the manufacturers' order book, and consequently the creation of sustained demands is a matter that calls for constant and scientific treatment. As competition becomes very much more acute, each manufacturer must adopt methods of advertising and publicity which have proved to be consistent business pullers, and a special book should be kept for recording the orders and instructions received, each entry giving the date, the customer's name and address, a detailed description of the products required, and the rate or price of each different kind.

Columns or sections are now usually provided in the order book for the insertion of the date of supply or despatch, also for any special observations or remarks, and it is advisable to show the sales book or day book folio against each entry. When an order has been fulfilled the transaction will automatically pass into the category of sales, and if the buyer is allowed a period of credit the full selling price will be posted from the book of original entry direct to the debit side of the particular personal account opened in the sales or customers' ledger.

Where no analysis of the sales is considered necessary or desirable, the monthly or other periodical totals of the sales book may be transferred to the credit side of a general sales account kept in the nominal or impersonal ledger; but if the manufacturer wishes to ascertain the margin of profit realised under two or more headings it is usually much more convenient to use a day book of the analytical type so that each transaction can be suitably classified at the time of making the original entry.

By using a book which has been provided by the printers with a sufficient number of cash columns, the trade purchases in the bought day book can be classified under specific headings and the monthly totals of each column debited to a separate goods or stock account. Various grades and concentrations usually appear under the general heading of "chemicals," and the "packages" column may include drums and kegs in addition to packages for pigments.

A separate "capital outlay" column is needed for the collection of all items representing the cost of acquiring new plant or renewing old equipment. Materials returned to the suppliers, including all allowances made in lieu of actual returns, may be entered at the end section of the purchases journal, where a few pages can usually be reserved for that purpose. The amount shown on each credit note is debited to the particular personal account, and the monthly totals either credited to the specific stock accounts or deducted from the corresponding monthly totals of the purchases before the latter are debited in the ledger.

The introduction of an appropriate book-keeping and costing system designed to expose any bad organisation enables some chemical manufacturers to compile a monthly trading account for each department and to separate the profit or loss on the working of the departments without the necessity of drafting a balance sheet.

Controlling Stocks

To be of any real practical utility in this respect, all stocks—with the exception of the small working stock for each department—should be under the control of the stores section, where proper accounts can be kept to show all fluctuations in value. When only one product is manufactured there may be little difficulty in determining the actual cost, but if a department manufactures a number of different products the allocation of costs may depend on the knowledge and experience of the technical staff as much as on the ability of the works accountant.

Those in charge of stores should be provided with stock cards to be attached to the different drawers, shelves and boxes, etc., thereby facilitating the recording of everything received and issued and a determination of the precise quantities on hand. Material required for the execution of an order is usually requisitioned on forms stating the product to be manufactured and the cost, and although the costing department is not concerned with materials until they have been issued, adequate supervision should be exercised over all acids, special fluids, metals and alloys, corrosive liquors and containers, etc., by keeping separate accounts showing the quantities, weights and numbers received and issued and the stock or balance remaining after the last issue to production.

Departmental profits or losses should be shown as separate items in the periodical trading or manufacturing account, the balance of which will be transferred to the profit and loss account, the main object of which is to arrive at the amount of net profit realised or the extent of the loss which has been sustained.

The figure of net profit shown in the final account will not, however, be accepted by the income tax authorities when computing the taxable profit under Schedule D, but will have to be subjected to very considerable adjustment for purposes of assessment. Certain items which have been charged to the account in the customary manner, while representing proper charges against revenue, will not be allowed to stand as deductions. Among these items may be the cost of structural alterations or repairs, additions, extensions or improvements to the business premises, and depreciation written off the book value of any asset or section of profit-earning equipment.

Wear and Tear

Although obsolescence and the decline of capital value constitute definite charges against profits, taxpayers are only granted wear and tear allowances which are considered by the Inland Revenue to be sufficient to cover those parts of the machinery and plant, etc., which have actually been worn out in the process of earning profits to be taxed. Such allowances must be claimed and not taken as granted.

Items representing ground rent, annual interest, annuities, or any payments of a similar nature from which income tax at the standard rate should have been deducted at the time of payment, are not allowed to stand as deductions, neither are expenses of a personal nature, of which are not directly connected with the ordinary business. Also in this category, i.e., not being allowed to stand as deductions, are private drawings of the proprietor, or the salaries of the partners, including interest on capital and any payments made to inactive partners.

When book debts previously written off are recovered and added to a reserve or suspense account, the sum involved should be added back to the balance of profit for assessment purposes, or deducted from the loss, as the case may be. In cases where the proprietor resides on the business premises, only the statutory allowances for rent, rates and lighting will be granted. Consequently, if the full amounts have been debited under these headings, a proportion will be added back for income tax purposes.

Deductions from Profit

Items of the following nature, however, may be deducted from the figure of profit: all normal expenses and business charges; allowances made to employees (or their wives or children) called up for National Service; an amount equal to the annual value of the business premises, providing no charge for rent has already been made in the final account: items which have been debited to a reserve account or to a suspense account, but which could have been charged to profit and loss; rents received in respect of property owned, where such rents have been treated as income in the accounts, and this applies to items of cash received from sub-tenants providing no charge has been made against profits in connection with the premises sub-let.

Isolated gains of a private or non-recurring nature, such as from the sale of investments, etc., are not subject to assessment, and a financial loss sustained by one business can be set against the amount of profit realised by another business under the same ownership.

In order to determine the figure of taxable profit it is advisable to compile a special income tax profit and loss account, on the credit side of which should be entered the balance of net profit as shown in the ordinary profit and loss account, and to which should be added the various items which are not allowed to stand as deductions. Against this total should then be debited the various allowances to which the taxpayer is legally entitled, apart from those already charged in the ordinary way.

Manufacturers of chemical products who do not maintain a proper set of books on modern lines are usually over-assessed each year, as it is difficult to ascertain the precise results without undertaking a considerable amount of detailed analytical work. In such cases, apart from the items allowed and not allowed by the income tax authorities in computing the balance of profit for assessment under Schedule D, a number of adjustments would have to be made, mainly in connection with debtors, creditors and stocks.

The following example will serve to indicate the method of ascertaining taxable profit from incomplete data. During the twelve months ended December 31 a chemical trader carrying on business on his own account and residing on the premises (which were rented at £210 per annum) was compelled to reduce his office expenses to such an extent that the keeping of a proper set of books was impossible. A complete record of the cash transactions had been made, however, and at the end of the year these items were dissected and grouped under appropriate headings to constitute a summary of receipts and payments. Stocktaking operations revealed an increase in the value of the stock as compared with the total at the termination of the previous year, and the book debts also showed an increase. The total sum owing to trade creditors was also higher, and the receipts and payments account was accordingly drawn up from the particulars available.

The cash balance was taken as the basis for the computation, the difference between the opening and closing balances being treated as profit to which the deductions not allowed were added. The income tax account was made up as below.

Some of the smaller firms in the chemical industry cannot always apply satisfactory systems of book-keeping and consequently the bank transactions often have to be classified and the business assets revalued. Professional assistance is not always necessary, but it is impossible to compute the precise income tax liability unless all the original transactions have been recorded correctly.

The profits of partnerships are often assessed on the firms and not on the individual partners. The personal allowances to which each partner is legally entitled, however, are usually considered in relation to that partner's share of the assessment, and it is of the utmost importance that proper records should be made of all pecuniary and trading transactions. Only in this way can the maximum relief be obtained.

Debit — INCOME TAX ACCOUNT — Credit

Debit	£	s.	d.	Credit	£	s.	d.
To Rents received ...				By Increase in cash balance ...			
,, Dividends received (tax deducted)				,, Payments not allowed:—			
,, Interest on loan (tax deducted)				Income tax			
,, Sale of tanks				Motor tax			
,, Increase in trade creditors				Mixing machines ...			
,, Balance, being taxable profit				Drawings (self)			
				Shop fittings			
				,, One-third of rent			
				,, Increase in stocks			
				,, Increase in debtors ...			
£				£			

Scottish Magnetite and Diatomite

THE extent of magnetite deposits in Shetland is being investigated by a team of scientists from the Geophysical Prospecting Co., Ltd., London. The deposits were worked during the war but mining ceased when overseas sources were again developed.

Steady progress in the exploitation of diatomite in Skye is reported and considerably increased output is expected by mid-summer. One of the main problems has been the construction of roads to the deposits. Government aid has been received and the roads should be completed within three months. Good quantities of high grade diatomite should then be available to British industries.

Popularising Science

TO popularise scientific knowledge UNESCO is distributing gramophone records of talks on science for the layman, to be broadcast in Denmark, South Africa, India, Australia and the Philippines. "Atomic Energy as a Natural Resource," "Climatology," "New Eyes to the Sky" (telescopes), and "Solar Energy" are the subjects of some of these 15-minute informal discussions. A further example of the organisation's work to promote education is the publication and distribution to libraries, science museums, schools, etc., of booklets on popular science. One of these, recently published, is "The Popularisation of Science through Books for Children," by Amabel Williams-Ellis.

The Chemist's Bookshelf

SOLVENTS: sixth edition. T. H. Durrans, Editor, E. Howard Tripp. London, 1950: Chapman & Hall, Ltd. Pp. XXVII + 213. 21s.

Few books compiled for chemists and chemical industry are of ephemeral interest, yet there are great disparities in the life spans of sundry works, for which the changing and unpredictable course of chemical interests is responsible. "Solvents" is an outstanding example of the kind which is destined to endure because of the unwavering interest in the materials with which it is concerned. Since the appearance of the first edition—in 1930—there has been practically continual increase of the number of organic solvents and of the essential industrial uses found for them, in the lacquer and related industries, for which "Solvents" is primarily intended, and in many others. These circumstances and the continual widening of knowledge of the properties even of some common solvents seem to have justified the six editions of the monograph, of which the latest collates much of the important information which has become available since 1944. Among the most useful expansions are those concerned with plasticisers and plastics and the subject of toxicity, of which the last have an increasingly urgent importance in modern industries. The data on toxic possibilities, while highly condensed, leave no excuse for neglecting rigorous safeguards in the employment of such common solvents as trichlorethylene, carbon tetrachloride, methyl alcohol and carbon disulphide.

SYNTHETISCHE METHODEN DER ORGANISCHEN CHEMIE. W. Theilheimer. 1949. S. Karger A.G., Basle, Switzerland. Pp. VIII + 412; S.Fr.40.

This is the third of the series dealing with new methods and principles of the synthesis of organic compounds and with improvements of older processes, of which the data have been collated from many international publications. The present edition is concerned with the 1946/7 period and part of 1948 and contains all titles of the two preceding parts. It is thus an important reference. An index key and general register of starting and end products will be of help to English readers, for whom some English and American methods, omitted in the former volumes, are reviewed. It represents a very useful source of information, supplementing the Beilstein series. Set up in a semi-tabular fashion, the information can be very readily identified. A full index permits the rapid location of the references on any particular synthesis.

COLOURS AND HOW TO SEE THEM. H. Hartridge. London: G. Bell & Sons, Ltd. 1949. Pp. 158. 15s.

The book is based on the author's Royal Institution Christmas Lecture and discusses popular science of an interesting variety. In six chapters it describes what is not commonly understood about natural phenomena; how, for example, are produced the colours of sky and sea, of the aurora, plants, birds and butterflies. Here it may be recalled that the famous German painter Franz v. Lenbach always worked in front of a butterfly collection. The mysterious light of fluorescence and phosphorescence is described, and the means by which colours are recorded. The eye and the colour processes in photography, printing and television, and the illusions which these processes can give, are interesting reading. The author shows how and why colours are used in nature, art, science and industry, and details the strange properties of colours. His book, illustrated with colour, half-tone and line, is one of universal interest.

Science in Industry

CHEMICAL industry in Australia is the first of four reports included in Bulletin No. 4 of a new series 'Science in Industry" recently published by Murray, Bull & Co., Ltd., London, under the title "Technical Knowledge as an Exportable Quantity." Opportunities for chemicals in Australia are reviewed in the control of pests of livestock, as weed-killers, insecticides and fungicides, in mining, food preservation, for soap and other detergents, the treatment of textiles and in the rubber industry.

Technical Publications

SECONDARY recrystallisation of face-centred Ni-Fe alloys is discussed by G. W. Rathenau and J. F. H. Custers in "Philips Research Reports" (Vol. 4, No. 4; Philips Electrical, Ltd.). It is shown that the primary texture of severely rolled Ni-Fe alloys is the cubic orientation, but at high temperatures secondary recrystallisation (abnormal grain growth) may occur. Several new orientations were found. In the same volume, A. Guinier and J. Tennevin compare the perfection of the crystals of primary and secondary recrystallisation. It was found that if a broadening of the reflected image occurred the lattice planes of the crystal under consideration were bent.

* * *

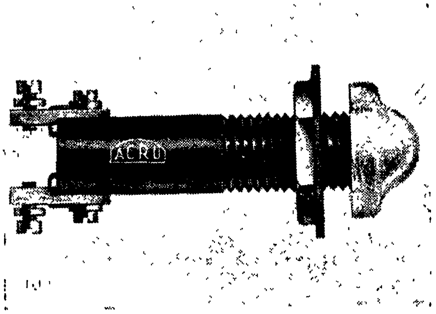
PRESENTATION of industry's viewpoint, together with practical considerations necessary to give a balanced knowledge of chemical engineering, are set out in the fourth volume of the "Journal of the Imperial College Chemical Engineering Society" (Volume 4, 1948) now available. Papers and lectures include the presidential address on "The Use of Graphical Methods in Chemical Engineering Calculation"; "Valves for Process Plant", by C. R. Colley; "Technology and Chemical Engineering Design", by A. D. Edwards; and a description of the research in the department of Chemical Engineering and Applied Physical Chemistry given on the opening of the new temporary laboratories.

* * *

THE newly published 28-page booklet, "Lithium in Modern Industry," reviews significant developments in lithium chemistry since 1940 and makes some forecasts. Edited by the technical rules, research and development staffs of the (U.S.) Foote Mineral Company, this publication discusses the chemistry of lithium and lithium salts, the industrial applications of lithium compounds, and newer uses of these materials. There is a carefully edited bibliography of technical references.

* * *

ESTIMATION of ventilation air temperatures in deep mines based on the fundamental laws governing heat flow, is the subject of the main article by J. de V. Lambrechts in the February issue (Vol. 50, No. 8) of the *Journal of the Chemical Metallurgical and Mining Society of South Africa*, now available.



[Courtesy, The Acru Electric Tool Mfg. Co., Ltd.

Neon indicator lamp for scientific instruments and processes depending upon electrical operation. It can be used directly on mains voltage up to 440 volts, has an average life of 25,000 hours and current consumption is low

APPLICATION and development of alkalis as scientifically designed detergents to suit the manifold requirements of industry are described in a new illustrated booklet just issued by Joseph Crosfield & Sons, Ltd., entitled: "Crosfield Detergents in Modern Industry." A comprehensive review of the silicate detergents is given without going too deeply into technical problems.

* * *

DEVELOPMENT of scientific research was the subject of a supplement, "Review of the Progress of Science," published last week by the *Times*. Many eminent scientists were among the contributors, including: Prof. E. N. da C. Andrade on "The Fabric of Research"; Sir Ben Lockspeiser, "The Scope of Industrial Research"; Sir Ian Heilbron and Dr. A. H. Cook, "Organic Chemistry" and Prof. R. E. Peierls, "Nuclear Physics Since the War."

* * *

"THE Manual of Open Die Forgings" (by the Open Die Forging Industry, 366 Madison Avenue, New York 17, N.Y.; $3) represents several years' preparation by a number of American metallurgists. It covers the methods, practices, specifications and inspection technique used in the manufacture of open die ferrous forgings. The chapter on manufacturing process practices covers the various types of materials, ingot variations, the several steps of operations, control, irregularities and heat treatment finish.

• HOME •

Chlorine Chemicals Record

A record production of packed liquid chlorine, hydrochloric acid and sodium hypochlorite was attained last year by the BC section of I.C.I., Ltd.'s Cassel Works, states *The I.C.I. Magazine.*

Change of Address

Dexion, Ltd., specialists in constructional units and general industrial equipment, has acquired new premises at Triumph House, 189 Regent Street, London, W.1.

Tour of Oxford Colleges

A conducted tour of the Oxford Colleges has been arranged for members and friends by the British Association of Chemists on Sunday, May 14. Tea will be served in the Hall of Jesus College, by courtesy of Dr. G. T. Young, president of the Alembic Club which is co-operating in the arrangements.

Memorial to I.C.I. Workers

A plaque recording the names of 24 employees of the Marston Excelsior works of I.C.I. Metals Division, Wolverhampton, who lost their lives in the war, was unveiled last week at the Ford Houses (Staffs.) factory. The ceremony was performed by Mr. H. E. Jackson, chairman of I.C.I. Metals Division. Some 1200 workpeople were present.

Mather Lecture

Mr. F. Scholefield, head of the department of textile chemistry, College of Technology, Manchester, will give this year's Mather lecture on May 10, at the Grand Hotel, Leicester, following the 40th annual meeting of the Textile Institute. The address will deal with the contributions made to the textile industry by the late Sir William Mather, who was president of the institute from 1915-17 and initiator in 1919 of its Foundation Fund.

Ultrasonics for Killing Bacteria

Dr. A. T. Palin, of the Newcastle and Gateshead Water Company, told the National Association of Bath Superintendents conference at Southport last week: "We are at the beginning of something new in the use of ultrasonic vibrations in the killing of bacteria, and the Institute of Water Engineers has a research group studying the problem." Free chlorine was now being used in preference to chloramine in purifying water because of its superior disinfecting powers.

TIDU's New Quarters

The Technical Information and Documents Unit is removing to Lacon House, Theobald's Road, London, W.C.1 (telephone Chancery 4411) on May 1.

Paraffin Wax Prices

New prices for various grades of paraffin wax as from May 1 were announced by Shell Mex and B.P., Ltd., ranging from 110°-115° F., £58 10s., to 145°-150° F., £101 17s. 6d. a ton in lots of one ton and upwards. The price of scale is £51 17s. 6d.

Benn Book Agency

Ernest Benn, Ltd., has been appointed selling agent for the books hitherto published by Lindsay Drummond, Ltd. Ernest Benn, Ltd. is an associate company of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE.

Coal Production

Britain's output of deep-mined coal last week was lower than in the previous week. Comparative figures are: Last week, 4,116,900 tons; previous week, 4,175,100 tons; week ended April 30, 1949, 4,074,500 tons.

Tar Distillery Fire

A fire at the Camelon works of Scottish Tar Distillers, Ltd., last week, destroyed some 50 tons of naphthalene. Fire brigades prevented the blaze from spreading to the benzoline and other derivatives stored in the plant, and it is not expected that work will be interrupted greatly by the damage.

Organising the Instrument Sections

THE full text of the paper "Organising the Instruments Section" (THE CHEMICAL AGEG 62, 615-618) delivered by Mr. V. H. Brown, instrument manager, Wilton Works, I.C.I., at a recent meeting in London of the Society of Instrument Technology, will appear in a future issue of the *Transactions* of the society.

Isotopes in Industry

A week-end course of lectures on "Isotopes in Industry" is to be held in the physics department of the University of Birmingham from Friday, May 19 to Sunday, May 21. The course, arranged by the Extra-Mural Department of the University, in co-operation with the Atomic Scientists' Association (Birmingham Branch), is intended for industrial engineers, metallurgists and chemists.

· PERSONAL ·

Mr. E. Player, new president of the Aluminium Development Association

DR. A. G. QUARRELL, research manager to the British Non-Ferrous Metals Research Association, has been appointed to the new chair of post-graduate physical metallurgy in the University of Sheffield. The doctor, who is 39 years of age, has carried out laboratory investigation of the phosphorous reaction in the basic steel-making process. His research has also included work with hydrogen in iron and its influence on hair-line crack formation, and, with an electron diffraction camera, examinations of the transformations in iron oxide during cooling from high temperatures.

The following retiring directors were re-elected at the annual meeting of The International Nickel Company of Canada, Ltd., in Toronto, last week: MR. JOHN P. BICKELL, MR. JAMES S. DUNCAN, SIR WILLIAM T. GRIFFITHS, MR. WILLIAM J. HUTCHINSON (treasurer), LORD MCGOWAN, DR. DONALD H. MCLAUGHLIN, DR. PAUL D. MERICA, SIR OTTO E. NIEMEYER, MR. LAURANCE S. ROCKEFELLER, MR. GRANT B. SHIPLEY, MR. R. EWART STAVERT, MR. J. C. TRAPHAGEN, and MR. HENRY S. WINGATE (vice-president and secretary).

MR. F. W. KENDRICK, recently Dunlop's acting sales manager for tyres in South Africa, has been appointed Dunlop tyre export manager in London. A Birmingham man, Mr. Kendrick was adviser to the Union of South Africa Rubber Controller during the war.

DR. K. D. JACOB, chief of the U.S. Dept. of Agriculture Fertiliser and Agricultural Lime Division, Beltsville, Maryland, was made an honorary member of the Fertiliser Society last week during the all-day meeting at which his paper was read by the visiting research scientists of the U.S. Department of Agriculture, MR. JOHN O. HARDESTY and DR. KENNETH G. CLARK. Only one other foreign scientist has been made an honorary member of the society, DR. SVEN NORDENGREN, of Sweden, who has also presented a paper to the society. Dr. Jacob's paper and the considerable discussion which it stimulated is referred to on page 667 of this issue.

Among those on whom honorary degrees were conferred at Oxford last week was SIR HAROLD HARTLEY, this year's president of the British Association. The Public Orator (Mr. T. F. Higham, Trinity) recalling the career of this former Fellow of Balliol, referred to his work as a leading physical chemist at Oxford and during the war as Controller of the Chemical Warfare Department, while later " railway and airway were alike entrusted to his capable and conscientious direction."

PROFESSOR JOHN READ, professor of chemistry in St. Andrews University, the winner of the 1949 Cortina-Ulisse European prize of 1 million lire for his book " A Direct Entry to Organic Chemistry," is using some of the prize-money to finance a lecture tour in Italy. The tour, which he is undertaking as a gesture of thanks to the Italians, was arranged by the British Council to take place between April 30 and May 23. He will lecture to scientists in 11 Italian cities, including Turin, Milan, Rome, Florence and Naples, on " Historical Science as an Instrument of Culture " and " Researches on the Chemistry of Australian Flora."

MR. HERBERT A. BATESON, of Bateson Bros., glass manufacturers, Liverpool, was elected president of the Society of Glass Technology at its annual meeting in Sheffield last week.

MR. B. G. CREWE, assistant controller of the Board of Trade Patent Office, retired at the end of April after nearly 50 years' continuous service. Mr. Crewe is an international authority on copyright and on industrial property.

• OVERSEAS •

U.S.A.'s Increased Iron Ore Imports

Imports by the U.S.A. of iron ore are reported to have been 8.3 million tons in 1949 (6.8 million tons in 1948). In 1947 they totalled 5,492,000, and in 1946, 3,085,000 tons.

U.S. Surplus Totals

The U.S. domestic sulphur industry produced 401,232 long tons of native sulphur during January, according to the officially collated reports of producers. Sulphur production in January 1949 totalled 416,678 long tons. Producers' stocks continued to decline.

Pierhead's Ocean Voyage

A 1000-ton pierhead, 200 ft. by 60 ft., now used as a floating oil dock in the Banka Strait, off the east coast of Sumatra has been towed by a Dutch tug from Southampton, via the Suez Canal—some 9000 miles in 67 days. The pierhead was once part of " Mulberry " the invasion harbour.

Swiss Exports in March

The value of Swiss exports of dyestuffs, etc., in March amounted to S.Fr. 18.1 million, compared with S.Fr. 17.1 million in February. Exports of pharmaceutical goods declined slightly from (S.Fr. million) 17.1 to 16.6. Shipments of industrial chemicals rose in value from 5.6 to 6.0 and those of cosmetics from 1.6 to 1.9. Total chemical exports realised S.Fr. 42.6 million.

More Tin from the Belgian Congo

The Compagnie Geologique et Miniere, Brussels, intends to embark upon a large-scale tin mining programme in the Katanga area of the Belgian Congo, following the discovery of important ore reserves. It is planned to erect additional smelters and to double the capacity of the Manono smelters to raise the productive capacity of the Belgian Congo to 20,500 long tons p.a.

Canadian Mineral and Oil Survey

More than $1.5 million has been provided in the estimates of the Canadian Department of Mines and Technical Surveys for the continuation of the systematic geological mapping of Canada, the study of potential sources of minerals, oil and natural gas, and for important ground water surveys. Particular attention will be given to those areas in the Prairie Provinces considered to contain oil, and a comprehensive investigation of the iron-ore region will be undertaken.

Scientific Council for S. Africa

It was officially announced from Cape Town last week that a conference will be held at South Africa House, London, from May 24 to 26 to discuss the establishment of a scientific council for Africa south of the Sahara, and to nominate scientists as members.

German Crude Oil

Crude oil output in the Federal German Republic in March amounted to 90,282 metric tons, an increase of nearly 10,000 metric tons over the February level. Output of the Quackenbrueck field, near Osnabrueck, which was opened up in February, registered a threefold increase.

Mercury Prices

The international mercury combine is stated to have been dissolved, although, in view of the hard currency earning power of this metal, Italian producers are understood to be in favour of a new agreement with the Spanish mines. The price of mercury has recently fallen considerably, and the present official export quotation ruling in Spain is now U.S. $52.50 per flask, f.o.b. for quantities up to 100 flasks. Production costs in Spain are stated to be stable.

Indian Model Salt Works

A model salt works is being laid out at Suleimansha in Bombay with a research station and laboratory attached. At several other places salt works on model lines according to the plans approved by the Salt Department will be laid out by private licensees. The Government of West Bengal has decided to pay Rs.100,000 to technicians of a French salt manufacturing concern to survey the Contai sea board for the establishment of a large scale factory.

French Scientist Dismissed

The French cabinet decided last week that in view of the declaration made by M. Joliot-Curie, the noted physicist, at the Communist national congress at Gennevilliers early last month, it was no longer possible to maintain him at his post as High Commissioner for Atomic Energy. The post itself has been abolished, largely due to the fact that a statement has been issued by the team of scientists who worked under M. Joliot-Curie, which expressed the conviction that although they did not share his political views " the future of the commission cannot be dissociated from the person of its founder."

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Hard Alloys, Ltd., High Wycombe, metal workers. (M., 6/5/50.) April 3, mort., to Halifax Building Society, securing £7330 and further advances; charged on factory and premises at Beach Road, The Marsh, High Wycombe. *Nil. June 22, 1949.

John Hinchcliff & Son, Ltd., South Elmsall, tar macadam manufacturers, etc. (M., 6/5/50.) March 30, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Central Garage, Barnsley Road, South Elmsall. *Nil. June 8, 1948.

Metal & Electro Chemicals, Ltd., London, S.W. (M., 6/5/50.) March 28, charge, to Williams Deacon's Bank, Ltd. securing all moneys due or to become due to the Bank; charged on 96 Pollards Hill North, Norbury, S.W. *Nil. February 24, 1950.

Whitehead Chemical Co., Ltd., Waterfoot. (M., 6/5/50.) April 4, charge, to Halifax Building Society, securing £2000 and further advances; charged on land at Warth, Waterfoot, and fixed plant and machinery. *—. April 1, 1948.

Xenit Products, Ltd., Slough, dealers in chemicals and fabrics, etc. (M., 6/5/50.) April 3, £2400 deb., to Sciaky Electric Welding Machines, Ltd.; general charge. *£5868. June 8, 1949.

Satisfactions

Pest Control, Ltd., Bourn (Cambs.). (M.S., 6/5/50.) Satisfaction April 6, of debs. reg. Feb. 9 and April 28, 1949.

Pest Control (United Kingdom), Ltd., Bourn, (Cambs.). (M.S., 6/5/50.) Satisfaction April 6, of debs. reg. Feb. 9, and April 28, 1949.

Solignum, Ltd., London, W.C., wood preservative manufacturers. (M.S., 6/5/50.) Satisfaction April 6, of charge reg. Sept. 18, 1931.

Zama, Ltd., Salford, textile waterproofers, etc. (M.S., 6/5/50.) Satisfaction April 11, of deb. and transfer respectively reg. June 11, 1930 and Feb. 9, 1940.

Company News

Albright & Wilson, Ltd.

The net profit of the Albright & Wilson group, attributable to shareholders for 1949, was £426,417. £66,000 was set aside for tax equalisation in respect of initial allowances, 1950-51, which arise from the parent company's capital expenditure in 1949. In addition, £62,000 was set aside from profits brought forward for initial allowances on capital expenditure in prior years. A final dividend of 15 per cent, less tax, on the ordinary stock was proposed.

Evans Medical Supplies, Ltd.

The directors declared a second interim dividend of 7 per cent, making a total distribution of 10 per cent for the year ended December 31, 1949.

I.C.I.'s Smaller Profits

The board of I.C.I., Ltd., in a preliminary statement announcing the forthcoming payment of a final ordinary dividend of 7 per cent to maintain the total year's dividend at 10 per cent, discloses that group profits in 1949, before taxation, declined to £17,828,509. The comparable figure in 1948 was £22,955,579, and both totals were reached after large provision had been made for obsolescence and depreciation (£4.5 million in 1949). Net income of the company, after deductions for subsidiaries and other charges was £9,791,503 (against £10,850,414).

Mullard Overseas, Ltd.

A new private company, Mullard Overseas, Ltd., has been incorporated, with a nominal capital of £250,000, to co-ordinate the export trade of the Mullard company from the United Kingdom.

Changes of Name

The following changes of name have been announced: Unifloc Reagent, Ltd., to Unifloc, Ltd.; Craghume, Ltd., to Severn Bridge Fertilizers, Ltd.; Ibco, Ltd., to Ibco Products, Ltd.; Portable Radiographs, Ltd., to Gamma & X-Rays, Ltd.; Air-Maze (Great Britain), Ltd., to Air-Maze, Ltd.

The Stock and Chemical Markets

MARKETS have taken their cue from British Funds, which remained uncertain, awaiting the result of the big British Electricity issue. Industrial shares moved narrowly and small declines seem to have predominated, opinion being influenced to some extent by the decreased profits reported by I.C.I., Ltd.

In common with a number of other large industrial concerns with world business, I.C.I. appears to have been affected last year by the effects of the minor and temporary slowing down of trade activity in the U.S.A. and by difficulties due to rising costs. Devaluation of sterling and other currencies on balance possibly had adverse effects on profits, it is thought in the City.

The full report and annual statement will be awaited with particular interest for an explanation of the change in the level of profits last year and for reference to prospects. The I.C.I. earnings have now come back roughly to the 1947 level, and profits continue to be dealt with conservatively. At 42s., the £1 ordinary units give a yield of nearly 4¾ per cent on the basis of the unchanged 10 per cent dividend.

Monsanto have eased to 47s., at which there is a yield of rather less than 4¾ per cent. Fisons were 22s. 6d. Albright & Wilson 5s. shares were steady at 28s. 9d. on the results and the unchanged 25 per cent dividend. In his annual statement the chairman refers to last year's decision to postpone the £1 million preference share issue because of general market conditions. Albright & Wilson will want more capital in due course.

Borax Consolidated have been steady at 51s. 6d., and Turner & Newall were good at 79s. 3d. on market talk of higher dividend prospects. United Molasses, at 41s. 9d., remained under the influence of the good impression created by the past year's results. The 4s. units of the Distillers Co. changed hands around 17s. 1½d. British Glues & Chemicals at 20s. 6d. were steady, but British Aluminium eased to 39s. 6d. British Oxygen eased to 91s. before the annual meeting, when reference is expected to be made to the company's new capital requirements and to whether an early issue is contemplated.

Iron and steels have been firm, helped by the good impression arising from results issued recently. Stewarts & Lloyds rose sharply to 53s. 9d. on the big increase in the past year's profits, which reflect benefits from the large capital expenditure for development in recent years. Guest Keen, at 42s. 9d., were again favoured on expectations of good financial results. Elsewhere, Staveley eased to 78s. 9d., but Tube Investments, at £5¾, were helped by the results of Stewarts & Lloyds, in which the company has a shareholding.

Triplex Glass at 19s. 8d. have held their recent improvement and United Glass Bottle rose further to 70s. Lever & Unilever were steadier at 40s. 9d. Boots Drug eased to 46s., Glaxo Laboratories were 46s. 10½d. and Associated Cement have been firm at 80s.

Shell were 61s. 10½d. and Anglo-Iranian £⅝.

Market Reports

TRADING in most sections of the industrial chemicals market is about normal for the time of year and delivery specifications under existing contracts are covering fairly good volumes. A steady flow of overseas inquiry is again reported with actual bookings well up to recent levels. The rise in non-ferrous metal prices has necessitated a number of price adjustments for chemical compounds but values otherwise are more or less unchanged. In the tar products market higher quotations are now ruling for benzols, toluols, xylols and naphthas as the result of the new tax on all indigenous light hydrocarbon oils.

MANCHESTER.—The generally firm undertone on the Manchester market for heavy chemical products has been further strengthened by the impending advance in railway freight rates and it is expected that this will be reflected within the coming weeks in higher prices in most sections. Meanwhile, a steady call for contract deliveries of the alkalis and other products has been reported this week, with a fair amount of new business on the home market as well as for export. The demand for most of the fertiliser materials remains at a seasonally high level. Taking the tar products market as a whole, there is a fair movement of supplies.

GLASGOW.—There has been considerable activity in the Scottish heavy chemical market, due to the fact that many are endeavouring to order ahead of the British Railways' proposed increase in rail rates, which, it is believed, will cause a very considerable increase in the cost of most goods. The Export Market is very inactive.

Next Week's Events

MONDAY, MAY 8

British Industries Fair

London: Olympia and Earls Court. Birmingham: Castle Bromwich. (Until May 19.)

Royal Institute of Chemistry

Hull: Royal Station Hotel, 7.0 p.m. Annual general meeting. Dr. H. Baines: "The Photographic Latent Image".

Porton: Chemical Defence Experimental Establishment, 8.30 p.m. (Mid-Southern Counties Section.) Dr. R. W. Pitman: "Some Aspects of the Chemistry of the Group VI Elements". (To be repeated at the Municipal Technical College, Bournemouth, Tuesday, May 9, at 7.30 p.m.)

TUESDAY, MAY 9

The Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Dr. J. W. Barrett: "Silicones—Their Production and Uses".

Society of Instrument Technology

Manchester: Reynolds Hall, College of Technology, 7.30 p.m. Annual general meeting. Dr. N. S. Gregory: "Some Modern Aspects of Hygrometry".

THURSDAY, MAY 11

The Royal Society

London: Burlington House, Piccadilly, W.1, 8.30 p.m. Conversazione and exhibition.

Incorporated Plant Engineers

Newcastle-on-Tyne: Turk's Head Hotel, 7.15 p.m. "Pumping Equipment" (Sigmund Pumps, Ltd.).

FRIDAY, MAY 12

The Chemical Society

Birmingham: The University, Edgbaston, 4.30 p.m. (with Birmingham University Chemical Society). Prof. C. A. Coulson: "The Shape of a Chemical Bond".

The Royal Institution

London: 21 Albemarle Street, W.1, 9.0 p.m. Sir Lawrence Bragg: "Famous Experiments in the Cavendish Laboratory".

Society of Glass Technology

St. Helens: Gas Showrooms, 6.0 p.m. Annnual general meeting and "Question Box".

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Dressing the Window

THE 29th British Industries Fair has revived in an acuter form than ever the problems of adequately representing chemicals of many kinds in a way which will please the eye of the general observer without repelling by its irrelevance the more exacting attention of the technical visitor. It can fairly be said that in the chemicals section of the fair which opened at Olympia, London, on Monday, practically all exhibitors have reached as happy a compromise as the familiar difficulties allow. All the large stands are decorative and adequate contributions to what it is customary now to regard as " Britain's shop window " and the section itself is a dignified outward symbol of the great economic and social force represented by Britain's increasingly virile chemical industries.

That certainly is the impression which will have been made on the substantial numbers of overseas visitors who have toured the BIF this week, providing a record attendance on the opening day, when 1150 passed through the turnstiles at Olympia and Earls Court in two hours. The total next day was 13,040.

The old problem of presenting in public what are usually the starting materials of a host of commodities, many of which reveal nothing of their origins is, however, very far from being resolved. It is very noticeable that the majority of large exhibitors this year have admitted that it is virtually impossible to make a compelling and comprehensible display of industrial chemicals alone. Few of the supplies of industry reveal so little of their qualities and uses as the white solids—powder or crystals—or the water-white or amber liquids, which are the forms in which a very large proportion of chemical materials and intermediates are delivered to industry. Almost all their qualities, such as the familiar " 99.9 per cent " label decorating so many of the flasks, are perversely imperceptible.

Since the first post-war exhibition in 1947, the policy underlying chemical manufacturers' displays at Olympia has been to subordinate chemical products as such to suggestive representations of end uses and the increasingly ingenious productive processes by which they are made available. That principle has produced some excellent and memorable results and continues to do so. The several excursions seen at last year's British Industries Fair into a realm verging on Piccasso-like symbolism do not appear to have commended

On Other Pages

Leader:

Dressing the Window . . 701

Notes and Comments:

Freight Rates and Prices . . 703
More Scope for Scientists? . . 703
"Something in the Finance Bill" 703
Towards International Standards 704
Exportable Chemical Surpluses . . 705
Parliamentary Topics . . 705
New British Standards . . 706
Automatic Measurement . . 706
Research on Flame Radiation . . 707
Basic Chemicals in February . . 708

Impressions of the 29th BIF

Chemicals and Instruments in London 709
Chemical Engineering at Birmingham 712
The Growing Employment of Plastics 716

A New Industrial Chemical . . 715
Progress of German Apparatus and Instruments . . 718
Drugs and Fine Chemicals in 1949—VI 719
Technical Publications . . 723
The Chemist's Bookshelf . . 724
Fertiliser Prices Raised . . 728
The Costly Ninepence . . 728
Open Days at CRL . . 732
Irish Institute of Chemistry . . 732

(The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

themselves, and their absence from the Olympia stands this year will probably not be regretted.

Restraint now would appear to be the guiding principle of the 1950 attempt to present British industrial and fine chemicals and photography, illuminated flow sheets and the like, have in many instances replaced chemicals as the dominant characteristics of stands. The notable exceptions are those companies whose production range includes pigments or dyestuffs, where the immediate appeal of the strong, pure colours now achieved by chemical ingenuity has greatly heightened the attractiveness of the whole section. Elsewhere, as in the principal exhibit of I.C.I., Ltd., the predominant aim has been to publicise the world-wide ramifications and services of the parent organisation.

While all these expedients have been employed with increasing skill and effectiveness and have doubtless contributed in encouraging the marked activity seen in the chemical industries' stands since the Fair's opening, this year has brought to mind with more than usual force some defects inherent in the BIF as a market place for United Kingdom chemicals. Many chemical manufacturers have in fact long since ceased to regard the exhibition in that light and their continued participation in the BIF is certainly not influenced by the value of orders directly attributable to the fair. That the BIF can confer on exhibitors other benefits, rather less tangible, is scarcely open to doubt, and if it were the continued adherence of most of the large chemical groups, which are not prone to disburse several thousands of pounds for frivolous reasons, would seem to settle the point.

Increasingly, however, the BIF is becoming the show place of the large chemical undertakings or of group exhibits. According to the official records issued by the fair authorities, there has been a significant expansion of the space used to display chemicals at Olympia this year, while the number of exhibitors has diminished. The reduction in the number exhibiting is in fact considerably less drastic than might be inferred by the official total of 59 (against 69 in 1949). Because increased use has been made of the practice of sharing stands the products of some 62 U.K. chemical enterprises are now on show at Olympia. There are, however, a few whose absence from this year's fair is

(*continued on page* 704)

Notes and Comments

Freight Rates and Prices

ONE of the factors which have helped to attract foreign buyers to the chemical, plastics and engineering sections of this year's BIF is the prospect that the cheaper £ and the general improvement in production technology would result in competitive prices. That promise has been fulfilled in many cases and the revelation, virtually coinciding with the Fair's opening, that the welcome price trend may now be reversed in a number of categories as a result of Government action in relation to transport could not have occurred more inopportunely. The immediate cause is the knowledge that from Monday next railway freights will be raised by 16⅔ per cent. The effect which that may be expected to have upon a large sector of chemical products involving bulk carriage was recognised by substantially increased buying in the chemical markets last week and this. The reality of that prospect has now been confirmed by the news this week that the Government-regulated prices of fertilisers are being raised on Monday by amounts ranging from 2s. 6d. per ton for superphosphates to 4s. for sulphate of ammonia. That certainly does not represent the full extent of the changes which must follow the imposition of a "railway tax" upon the production of the heavy industries. The British Iron and Steel Federation this week supplied another instance of the effect of this burden, revealing that steelmaking costs will rise by approximately 10s. per ton. Perhaps the most significant fact in that connection is that the independent steel industry has decided to bear the extra cost itself, being reluctant "to aggravate further the spiral of inflationary price increases."

More Scope for Scientists?

THE rare Parliamentary phenomenon of almost complete agreement between the Government and the Opposition was produced last week by a private members' motion for the fullest encouragement of what is generally indicated by the term "science in industry." "Science" in that context generally stands for applied chemistry and engineering; but the uncertainty whether science or technology was the main objective did not prevent both sides of the House giving convincing evidence of Parliament's benevolent intentions towards the people who employ the scientific method in providing answers to industry's problems. The motion by a Labour Party member (Mr. M. P. Price), which a Conservative member (Mr. Erroll) seconded, would have given more satisfaction and stimulus to research people as a whole had it been in more concrete terms. The fact, however, that the House accepted without a dissentient voice the proposition "That there should be the fullest development and utilisation of Britain's exceptional scientific resources and manpower . . ." can be taken as the equivalent of a vote of confidence in the principle of scientific direction in industry. From that position to the allocation of considerably more generous grants to the research and training institutes is not an impossibly long step.

"Something in the Finance Bill"

THE customary spokesman on scientific affairs in the Commons, Mr. Herbert Morrison, did not give much encouragement for the hope that any revolutionary change is to be expected in the Government's view of its responsibility to stimulate scientific advances and their use in industries. The most promising passage in the Lord President of the Council's contribution was the indication that the House would shortly hear "something in the Finance Bill" relating to expenditure on scientific research and its applications in industry, which he said always received specially favourable consideration by the Treasury. The Lord President of the Council's apparent complacency about the rate of advance in these directions seems to have afforded a marked contrast with the urgent desire of ordinary members on both sides to see the Government adopt a much more positive policy towards the practical problems of the development of research resources and individual projects. Nothing was said of what would undoubtedly be the most direct means of stimulating the kind of research of immediate benefit to productiveness—a generous revision of taxation allowances to encourage the fullest employment of industrial laboratories and the most advanced equipment.

Towards International Standards

THE growing significance in the field of chemistry of therapeutic materials has been self-evident for a long time, but little attention has commonly been paid, except among the specialists, to the need to regulate the use and standardise the remarkably potent new substances, of which the antibiotics and the anti-pernicious anaemia factor vitamin B_{12} are among the more celebrated examples. The principal agency working to prevent the chaos and the probable discrediting of some of these boons to humanity, which faulty preparation and misuse would invite, is now holding its third international assembly in Geneva. That is the World Health Organisation, newest of the groups within the United Nations Organisation, which is rapidly formulating a code for virtually all countries, except those whose isolation has been enforced by the U.S.S.R., which should ensure that these new drugs and others are of uniform purity and potency. That ideal is safeguarded here by Acts of Parliament, but similar precautions against the substitution of sub-standard preparations in other parts of the world are often lacking. The work now being reported and implemented at Geneva is a most important continuation of the pioneer work of the League of Nations Health Organisation, which had standardised more than 30 therapeutic substances when the last war interrupted it. WHO, fortunately, has several responsible collaborators around the world in securing international recognition of biological and chemical standards, including the Internatonal Union of Chemistry. Not the least important phase of this exacting and indispensable undertaking is the preparation, for issue this year, of the first International Pharmacopoeia which will lay down international standards of identity, quality, strength and purity of more than 200 drugs. To this the essential data on antibiotics will be added later, in view of the advances still being made in this field. The first volume, which will be in English, French and Spanish, represents only the initial stage in a great project, calculated ultimately to confer real benefits on world health services and pharmaceutical industries.

DRESSING THE WINDOW

(continued from page 702)

conspicuous. Among these are May & Baker, Boots Pure Drug Company, and the North Thames gas undertaking.

Any estimate of the effectiveness of the BIF as the showplace for British chemical products must pay regard to the absence of any adequate alternative opportunity of meeting overseas buyers and technologists on our own ground, and the very serious difficulties which would encompass any attempt to provide one. By the successful operation of the co-operative principle under Government auspices and the employment of some indispensable State resources this annual show of British chemicals receives a fuller measure of support in the form of overseas advertising and publicity than any sectional exhibition could economically procure. This year, moreover, there is already some evidence that the lowering of British prices as an effect of devaluation and the increasing scale of production and efficiency is exciting as much interest as could be aroused by displays appealing more directly to the industrial chemists.

EXPORTABLE CHEMICAL SURPLUSES

Record of British and European Balances

THE Organisation for European Economic Co-operation (OEEC) has published a book of over a hundred quarto pages on the subject of the exportable surpluses of chemical products in the 18 participating countries. It is printed throughout in French and English, the two texts being on opposite pages. Actual details are given only in regard to Austria, Belgium, France, Germany, Ireland, Italy, Luxemburg, Norway, The Netherlands, Sweden, Switzerland, Trieste, and the United Kingdom, the only countries which had, at the time the memorandum went to press, replied to the organisation's questionnaire.

Exportable surpluses are defined as follows: Actual surpluses are stocks not covered by orders (not including working stocks); potential surpluses represent that part of working capacity unused owing to lack of demand.

Britain did not provide precise quantities of surpluses either at a given date or in the form of regular monthly estimates, but indicated whether the supplies for export were "limited," "adequate" or "ample." The three terms are defined as follows: "Limited" means that some, but not all, of the export demand can be met; "adequate" means that all the export demand of which the United Kingdom is aware can be met; "ample" means that all the export demand of which Britain is aware can be met as well as any reasonable additional demand.

Britain's list of chemicals under the heading of "limited" is a very long one, and includes such items as carbon blacks, solid caustic soda, zinc oxide, titanium oxide, chlorates, alums, white lead, lithopone, calcium carbide, benzene, toluene, acetic acid, stearic acid, etc. Streptomycin is included with the "limited" items, with the remark "more later in the year."

Under the heading of "adequate," Britain's list includes, chlorine, activated carbon (certain types), tin oxide (supplies could be increased), sodium hydrosulphite, silicates and metasilicates, naphthalene, nitroglycerin, cresol (most grades), ethyl ether (sulphuric ether), tricresylphosphate (plasticiser), etc.

"Ample" exportable surpluses are stated to exist in Britain of a large number of items, including the following: Copper sulphate, arsenates, sodium carbonate, sodium bicarbonate, bichromates, aliphatic chlorides, hexachlorocyclohexane, DDT, methyl alcohol, stearic and cetylic alcohol, formaldehyde, adipic acid, lactic acid, tartaric acid, acetyl-salicyclic acid, urear, sulphonamides and similar preparations, glucose, penicillin, a long list of phamaceutical products, and most disinfectants and insecticides.

Parliamentary Topics

REPLYING to a question about flour improver, Mr. F. T. Willey, Parliamentary Secretary to the Minister of Food. stated that while the use of nitrogen trichloride or agene was being discontinued, he did not propose to insist on the exclusive use of chlorine dioxide for this purpose.

DURING the debate on the motion by Mr. Philips Price urging that the fullest use should be made of Britain's scientific resources, Mr. Herbert Morrison, Lord President of the Council, again referred to the scheme sponsored by the Royal Society to house in one building the three great research bodies—the Department of Scientific and Industrial Research, the Medical Research Council, and the Agricultural Research Council—the Royal Society and a number of other scientific and learned bodies and make a really great centre of science on a worthy site in London. This would be well worth doing.

POSSIBLE danger to the consumer of strawberries from the Continent which had been sprayed with one of the new insecticides based on the organic phosphorous compound parathion was mentioned by Sir George Jeffreys. Replying for the Minister of Food, Mr. F. T. Willey, Parliamentary Secretary, stated that so long as this compound was used in accordance with instructions of the manufacturers there was no danger to consumers. Medical officers of health at sea and airports already had power to examine foodstuffs on arrival, but the Minister was considering whether to give these officers special advice about imported strawberries.

NEW BRITISH STANDARDS

Solvents and Allied Products

A NEW series of standards for solvents and allied products is being issued by the British Standards Institution and the first 18 have now been published. Most of these are revisions of standards issued between 1933 and 1936, but the last three are completely new. The list is as follows:

BS. 506; 1950 methyl alchol; 507 ethyl alcohol (ethanol); 508, normal butyl alcohol (butanol); 509, acetone; 549, diacetone alcohol; 551, normal butyl acetate; 552, amyl acetate; 553, ethyl acetate; 573, dibutyl phthalate; 574, diethyl phthalate; 575, carbon tetrachloride; 576, acetic acid; 580, trichlorethylene (types A. B.and C); 662, carbon disulphide; 663, ethyl lactate; 1593 perchlorethylene; 1594, diacetin (glyceryl diacetate); 1595, isopropyl alchohol (isopropanol).

Interchangeable conical ground glass joints are the subject of B.S. 572: 1950, which revises the 1934 edition of this standard. The number of joints has been reduced from 68 to 35 by omitting the whole of series A, and other joints which experience has shown to be little used. Three new sizes have been added in series C for certain purposes such as flask stoppers, for which the previous range was insufficient. Some minor changes of length have been made but the joints remain interchangeable with those specified in the original standard. The appendix on gauging has been revised and a table included of dimensions and tolerances for gauges for each size of joint.

Vegetable Oils

To provide a more convenient form of document, standards for vegetable oils have been revised and are now incorporated in one volume, which covers B.S. Nos. 628/32 and B.S. 650/56. Detailed specifications covering physical characteristics for each of the oils and methods of test are given.

Methods contained in the original B.S. 684, first published in 1936, were the English translation of the French text of methods prepared by the International Commission for the Study of Fats, and were published to assist in promoting uniformity among nations in regard to the analysis of fats. British methods were considered by the International Commission for the Study of Fats in preparing the third edition of the internationally agreed methods (1948), the English translations of which are included in the revision of this standard now issued. It is recognised that, even so, B.S. 684 does not provide a complete set of methods for the analysis of oils and fats, and it is hoped shortly to publish a separate document covering further methods.

AUTOMATIC MEASUREMENT

NPL Work on Sieve Meshes

THE part of the National Physical Laboratory in providing technical assistance to chemical and many other industries includes research in almost any direction calculated to improve the physical characteristics of the instruments which serve them.

The NPL has now developed an apparatus for the automatic determination of the statistical distribution of wire-spacing in sieves. It is designed to measure the spacing between successive warp or weft wires and express the result in terms of the statistical distribution of the actual wire spacings in relation to the nominal.

Sieves of 300 to 10 mesh in. can be measured. In the case of screening material, it is, of course, the size of the largest holes as compared with the nominal which is more important.

A 100-mesh sieve which is woven on a loom in the normal way and has fairly even spacing between the warp wires, is liable, however, to have greater space variations between the weft wires. A representative of THE CHEMICAL AGE was shown how such a sieve is measured.

The width of each mesh in a 2-in. row is measured in a single operation. To obtain a reliable indication of the quality of the sieve, measurements are taken across the warp and weft wires.

The sieve is projected on to a screen, with an optical magnification of 40. An optical head is then traversed over it by a motor-driven micrometer lead screw. The lead screw is geared to a pulse generator which gives pulses proportional to the movement of the optical head.

Electronic Counter

As the optical head traverses the sieve, the width of each mesh is measured by counting the pulses which occur. To signal the start and finish of each mesh a very small mirror on the screen reflects the image on to a fine slit, .0015 in. wide by 3/16 in. long, in front of a photo-multiplier cell.

The pulses are recorded by an electronic counter, the count being controlled by a signal from the photo multiplier as the edge of the wire on each side of the mesh passes the slit. When each mesh has been traversed the width is given in terms of the number of pulses counted.

During the passage of the wire across the slit, a sequence of operations is started, which allows time for relays in

(*continued at foot of page* 708)

RESEARCH ON FLAME RADIATION

International Study of Heat Transfer Factors

PHYSICISTS, engineers, chemists and statisticians of France, Holland and Great Britain, to be joined later by a Swedish scientist, are co-operating in an investigation of the factors affecting luminous flame radiation, using an experimental furnace in the Royal Dutch Steelworks at Ijmuiden, Holland. Observers from the U.S.A. are expected to visit the trials at a later date.

Flame radiation is of great importance in relation to the mechanism of heat transfer in furnaces and boilers, but very little is yet known on the subject. A statement by the British Iron and Steel Research Association now recalls that at the end of 1948 it was decided to start this joint research and the Royal Dutch Steelworks made available their experimental furnace. That was built in 1947/48 for the study of the radiation from oil flames of a size comparable with those in open-hearth steelmaking furnaces.

During 1949 three teams were built up in Holland consisting of physicists from the British Iron and Steel Research Association, United Steel Companies and Pilkington's from Great Britain; from IRSID, the Institut du Petrole, Air Liquide and the Laboratoire des Hautes Temperatures from France; and from the Royal Dutch Steelworks and the Royal Dutch Shell Oil Company (BPM) who also supplied all the reference oil for the tests.

The general plan agreed on for the research was that two kinds of trial should be carried out, termed respectively "engineering" and "scientific" trials.

Measuring the Factors

In engineering trials a large number of independent variables such as fuel rate, kind of fuel (various oils, pitch, pulverised coal, coke oven gas), kind of burner or port, excess air ratio, etc., are altered systematically and a limited number of radiation, temperature and combustion properties of the flame are measured for each flame setting.

In scientific trials a relatively small number of different flame settings are to be studied in great detail by means of probes so that, for example, the course of combustion of individual droplets, the mechanism of soot formation and the emissivity and temperature of different parts of the flame can be elucidated in detail.

Statistical methods have been used to plan the first series of engineering trials. It was decided to choose five variables (creosote pitch *versus* oil, high and low combustion air rate, high and low fuel rate, high and low atomising medium flow rate, and air *versus* steam as atomising medium) and to carry out 48 trials according to a factorial scheme. This has been the first attempt to apply to a large-scale furnace these methods of designing experiments, which were originally developed for agricultural trials.

Successful Trials

Thanks to extremely hard work and ingenious improvisations on the part of the international team, 47 out of these 48 trials have been successfully completed. The results are now being worked out and are expected to provide valuable scientific information, and also to indicate the next step.

The work is supervised by committees set up in the three countries, each supported by many firms and organisations in their own country. The chairmen are:—

France: Prof. G. M. Ribaud, Membre de l'Institut, director of research of the French gas industry, and director of the Laboratoire des Hautes Temperatures.

Great Britain: Prof O. A. Saunders, Imperial College of Science and Technology, chairman of the Heat Transfer Committee of the Mechanical Engineering Research Board, and of numerous other committees dealing with heat transfer.

Holland: Mr. J. E. de Graaf, chief of research of the Royal Dutch Steelworks, who was responsible for the conception of the experimental furnace.

A joint committee of the three countries has been set up to co-ordinate the work, with Prof. Ribaud as chairman, and each national committee has appointed two representatives. In charge of the studies included in the research programme is Mr. M. W. Thring, head of the British Iron and Steel Research Association's physics department.

[Other organisations or firms wishing for further information, or to take part in the work of the joint committee should write to: The Secretary, The Flame Radiation Research British Committee, c/o BISRA, Physics Laboratories, 140 Battersea Park Road, London, S.W.11.]

Basic Chemicals in February

Improvement Maintained in Production and Stocks

THE steady increase in production of basic chemicals and non-ferrous metals which marked the start of the year was maintained in February, levels being higher throughout than in the same month of last year. Stocks also improved, with the exception of molasses and industrial alcohol. Consumption, except in a few cases, was higher than in February, 1949.

Estimated numbers employed in the chemical and allied trades, with a total (in thousands) of 445.4, remained the same as the first month of this year, but was 14.3 higher than in February, 1949. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 257.4 (188.6 men, 68.8 women); paints and varnishes 38.2 (27.1 men, 11.1 women); oils, greases, glue, etc., 67.5 (54.1 men, 13.4 women); pharmaceuticals, toilet preparations, etc., 82.8 (42.7 men, 39.6 women).

The figures and the table below are abstracted from the *Monthly Digest of Statistics*, No. 52 (HMSO, 2s. 6d.).

	February, 1950 Thousand Tons			February, 1950 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	136.2	144.0	—	126.5	134.0	—
Sulphur	—	26.2	85.6	—	22.9	66.3
Pyrites	—	17.4	78.0	—	18.0	63.0
Spent oxide	—	15.6	181.1	—	15.4	168.0
Molasses (cane and beet)	8.1	35.0*	254.3	7.3	19.4*	269.3
Industrial alcohol (mil. bulk gal.) ...	2.41	2.58	0.67	1.39	2.17	6.28
Ammonia	—	7.06	5.57†	—	6.96	5.95†
Superphosphate	18.5	25.4	—	18.4	21.1	—
Compound fertiliser	167.4	212.0	—	150.6	204.5	—
Liming materials	—	408.8	—	—	352.9	—
Nitrogen content of nitrogenous fertilisers	20.97	24.13	—	20.02	22.38	—
Phosphate rock	—	86.0	221.8	—	89.6	165.5
Virgin aluminium	2.30	13.0	—	2.40	16.5	—
Virgin copper	—	26.8	119.3	—	27.3	105.1
Virgin zinc	5.50	19.4	48.2	5.04	16.9	39.8
Refined lead	5.47	12.7	64.1	3.96	12.4	23.0
Tin	—	2.17	—	2.37	1.97	18.8
Zinc concentrates	—	12.5	63.8	—	11.8	27.6
Magnesium	0.32	0.33	—	0.37	0.44	—
Pig iron	184.0	147.0	517.0	181.0	140.0	265.0
Steel ingots and castings (including alloys)	325.0	—	1,257.0	311.0	—	1,000.0
Rubber: Reclaimed	0.51	0.49	2.36	0.37	0.45	3.97
Natural (including latex) ...	—	4.64	41.8	—	5.25	45.1
Synthetic	—	0.06	1.13	—	0.05	1.87

* Distilling only. † January.

AUTOMATIC MEASUREMENT

(*continued from page* 706)

the electronic counter circuit to operate, passes a current through them to operate an electromagnetic counter, and finally resets the electronic counter to measure the next mesh.

There are 22 electromagnetic counters, 20 of which represent size groups 2, 5 or 10 per cent of the nominal size of mesh for a specific setting. The remaining two counters record the number of meshes above or below the range covered by the other 20. At the end of the 2 in. traverse, every mesh in the section has been measured, the distribution of sizes being shown on the counters.

The setting of 2, 5 or 10 per cent groups is fixed according to the fineness of mesh and its quality, finer meshes requiring the larger groupings. Measuring speed is approximately 1 mesh per second. The apparatus has not yet been tried on fabric sieves and it is uncertain whether such an application would prove satisfactory, since loose fibres might confuse the results. It is adaptable, however, for measuring parts of a complete roll of sieve material, which may be 4 ft. wide.

Demonstrations at the Physical Society Exhibition attracted considerable attention, inquiries being received from research institutions and from chemical manufacturers and the cement and dyestuffs industries.

The apparatus is expensive but, at a centre such as the National Physical Laboratory, it could be used for testing sieves on behalf of manufacturers and users. The data obtained from such tests will enable the quality of present-day sieves to be appraised.

IMPRESSIONS OF THE 29th BIF

CHEMICALS & INSTRUMENTS IN LONDON

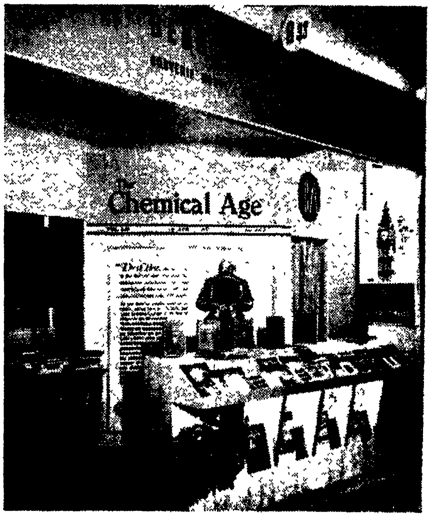
THE opening stage this week of the 29th British Industries Fair revealed some interesting contrasts with the last fair. While attendance on the opening day cannot be taken as being a reliable indication of the general level of interest, the comparison of numbers registered on Monday and on the opening day on the last occasion appeared to show a noteworthy change in the distribution between home and overseas visitors. Attendance from overseas at all three centres on the first day was markedly larger than in 1949, proportionately the largest increase being recorded at the engineering and allied sections at Castle Bromwich, Birmingham, where the 352 visitors contrasted with 261 last year. At Olympia the foreign contingent numbered 1587, against 1541 last year, and at Earls Court 1485, against 1216. At both the London centres the number of home buyers was smaller than last year's: 4728 at Olympia (5157) and 3871 at Earls Court (5059). Castle Bromwich alone received more attention from the same quarter than it did last year—1961, compared with 1759. Much more substantial figures for the three centres were recorded on Tuesday: home buyers 10,568; overseas 3511.

"C.A." STANDS

The Chemical Age *and companion journals of Benn Brothers, Ltd., are represented at the British Industries Fair in London at Earls Court and Olympia, and Castle Bromwich, Birmingham. The following telephone numbers have been allotted to the various stands:— Stand X13, Earls Court, FULham 8292; Stand B33, Olympia, RENown 5162; Stand A427, Castle Bromwich, FAIR 213.*

Olympia, as the principal centre of interest for science and industrial chemistry, gained much of its attraction for people from overseas from the representation within the Scientific Instruments Manufacturers' Association group exhibit of the considerable advances made in electronic and electric apparatus and optical and measuring equipment. Nearby, the first comparatively revealing representation of Britain's largest atomic pile—BEPO, shown as a 9 ft. high "working" model—appeared to form the source of principal interest to visitors from other countries.

The slight reduction—to 62—in the number of exhibitors of industrial chemicals this year has permitted a more liberal use of space, of which effective use has been made by individual exhibitors. There are, however, probably fewer chemicals physically represented than at previous exhibitions. In their place, emphasis has been laid upon the considerable improvements which have been made in technical qualities and graphic representation of advanced production methods and the rewarding use of the chemical products in many departments of industry. The more competitive prices made possible in some directions by changed currency values was expected to afford some stimulus to actual sales.



At Olympia

Among the new or modified products noted in the displays of instruments and chemicals were these:—

ON the stand of W. & J. George & Becker, Ltd., interest this year is centred on its new aperiodic balance, being shown for the first time. This has a capacity of 200 gm. and is sensitive to 0.1 mg. The weights up to 100 gm. are applied automatically by means of a weight change mechanism (the subject of a patent application) which is entirely new and simple to use. There are only three dials to operate: one for the 10 gm. to 90 gm. weights (in steps of 10 gm.) another for the 1 gm. to 9 gm. series (in steps of 1 gm.), the third controlling the two ring weights of 300 and 600 mg. respectively.—**Stand C61, Olympia.**

* * *

SCIENTIFIC and optical glassware exhibited by CHANCE BROS., LTD., at Olympia in the SIMA section includes a wide range of articles, such as cathode-ray tubes for television, precision bore tubing for use in pump cylinders hypodermic syringe barrels, viscometers, thermometers, etc. Also shown are all-glass syringes made with interchangeable parts, optical glass slabs, mouldings, colour filter glass, microscope cover glasses, Flamemaster hand torches for use in light welding and glass working with gas/air or gas/oxygen, etc. The stand in the Birmingham section of the fair of Chance Bros., Ltd., includes submersible electric pump units, and a feature there is the Chance square beam airport location beacon. which is being exhibited for the first time. This is stated to have a luminous range up to 60 miles under clear weather conditions. The Earls Court stand of this firm is devoted to examples of its wide range of domestic glassware and building glass.—**Stand C32, Olympia; S11, Earls Court; C622, Birmingham.**

* * *

THE instruments shown by CINEMA-TELEVISION, LTD., demonstrate the many applications of electronics to both research and industry. A new range of portable metal detectors incorporating improvements to the firm's original models are being shown for the first time. Among the instruments being demonstrated is the industrial electronic metal detector for locating minute pieces of ferrous or non-ferrous metal in foodstuffs, plastics, confectionery, etc.—**Stand C16, Olympia.**

AMONG the laboratory glassware and chemical apparatus exhibits at the Olympia sections is that of H. J. ELLIOTT, LTD., which is showing several improved types of equipment additional to those exhibited at the 1949 exhibition. These include a stoppered measuring cylinder, with an increased width of neck, making for faster pouring and easier cleaning after use. There is also a fully comprehensive range of the firm's other products, which embraces apparatus with the exclusive chemically resistant coloured fillings in the graduations, and the patented E-MIL plastic stoppers for measuring flasks and cylinders.—**Stand C29, Olympia.**

* * *

EXAMPLES of oils before and after treatment with fullers' earth can be seen at the Olympia stand of the FULLERS' EARTH UNION, LTD. Exhibits include natural fullers' earth used as a base for insecticide powders, pigments, pharmacy and bleaching oils; Fullbent for making emulsions and suspensions and Fullbond for bonding foundry moulding sands. The last named is displayed in more detail at Birmingham.—**Stand B18, Olympia, and D117, Castle Bromwich.**

* * *

IN the scientific instruments section at Olympia, HILGER & WATTS, LTD., is showing (in conjunction with other constituent members of SCIEX) a selection of its latest survey and drawing instruments, a new series of precision scales and microscopes, and an optical scale Dubosq colorimeter. At Birmingham, Hilger & Watts, Ltd., is showing (on the stand of Alfred Herbert, Ltd.) an instrument designed to measure the profiles of wire-drawing dies, also a range of engineers' optical measuring instruments.—**Stand C56, 57 and 58, Olympia. and D319 and 216, Birmingham.**

* * *

OVERSEAS organisation is the main theme of the display by IMPERIAL CHEMICAL INDUSTRIES, LTD. Maps and photographs tell how by direct exports of chemicals and non-ferrous metals I.C.I. earns £41 million a year for Britain. Details are given of the company's interests in Africa, Argentine, Australia, Brazil, Canada, India and Pakistan.—**Stand B12, Olympia.**

Part of the colourful display by Brotherton and Co., Ltd., representing the newer dyestuffs

AN UNUSUAL display situated on the boundary of the chemical and jewellery and silverware sections is the stand of JOHNSON, MATTHEY & CO., LTD., as the widespread activities of the firm are linked to both craft and industry. Silver used by the silversmith is linked to the industrial applications of the metal by showing electrodeposited silver in chemical engineering. The gulf between employment of the platinum metals and gold as essential materials in chemical engineering and their use by the manufacturing jeweller is bridged by a display dealing with rhodium as an electrodeposit, in which form it finds extensive use both for decorative and industrial work.—**Stand B40, Olympia, and F9, Earls Court.**

* * *

TWO new pentachlorophenol preparations, Santobrite and Santophen-20, manufactured for the first time in this country at its factory in Newport, Monmouthshire, are contact herbicides featured among the 200 chemicals supplied to industry by MONSANTO CHEMICALS. Special attention is drawn to a group of agricultural chemicals comprising 2, 4-D weed-killer, Niran insecticide, Methasan and Thiurad fungicides.—**Stand B1, Olympia.**

* * *

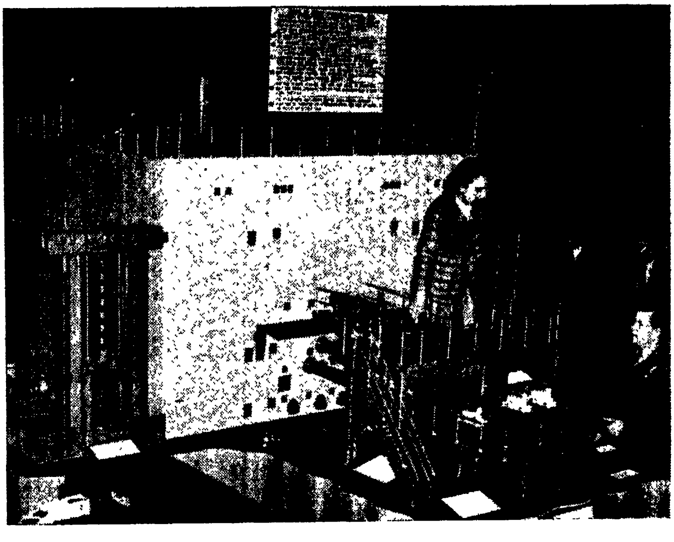
EMPHASIS on plasticisers is the keynote of the range of organic chemicals displayed by THE WATFORD CHEMICAL CO., LTD. Products include the principal phthalic esters, dibutyl tartrate, butyl oleate and high boiling solvents. Among the fine chemicals the new synthetic caffeine is on view. This will, for the present, be sold at prices in line with natural caffeine and will comply with BP, USP and DAB standards. Full production is expected during the second half of this year. The increased production of ethylene from the new British oil refineries has led to the introduction of a range of polyethylene and ethylene oxide condensation products, for use as non-ionic surface active agents and emulsifiers.—**Stand B43, Olympia.**

* * *

VARIOUS stages in the manufacture of Teepol are depicted by an animated flow chart on the stand of SHELL CHEMICALS, LTD. Flanking the chart are panels bearing descriptions of the process and data regarding the applications of the finished product. The Shell range of ketones and alcohols manufactured at the new chemical plant at Stanlow are also represented, and there is a series of photographs of this plant.—**Stand B22, Olympia.**

* * *

A DRUG for the treatment of leprosy—diaminodiphenylsulphone — now being issued in tablet form under the trade name of Avlosulfon is being given prominence by IMPERIAL CHEMICAL (PHARMACEUTICALS), LTD. It is claimed that considerably smaller doses are required than of sulphones, and that no significant toxic effects are produced. Other exhibits include the trypanocidal drug, antrycide; trilene, an inhalational anæsthetic and analgesic; and sulphamezathine —one of the most widely used sulpha drugs.—**Stand No. B32, Olympia.**



Britain's leadership in Europe in promoting the peaceful uses of atomic reactors was reflected in the Ministry of Supply exhibition of an exact replica of the large pile at Harwell and of the methods of using radiation in industry and of preparing special materials, such as C_{14}

IMPRESSIONS OF THE 29th B.I.F.

CHEMICAL ENGINEERING AT BIRMINGHAM

THE sections of the British Industries Fair at Castle Bromwich, Birmingham, devoted principally to exhibits in the classifications of engineering and hardware, have again offered plenty of interest to the chemical and related trades. There are on show, for example, bench burners for glass working; fine grinders for a variety of chemical materials; furnaces for all heat-treatment processes and laboratory muffles; pumps for oil refineries and chemical works; measuring instruments for chemical engineering precision work; stoneware and porcelain plant for the chemical industry and laboratory; oil fractionating columns; emergency lighting equipment; chemicals for metal treatment; tinning baths.

Attendance at Castle Bromwich on the opening day (Monday) was substantially larger than on the same day last year, and the number of overseas buyers—352—was about 35 per cent higher than last year. Over 1000 buyers (371 overseas) visited the exhibition on Tuesday.

U.S. Markets

A notable feature at Castle Bromwich is the bold attempt to develop trade with the United States, and on the opening day there were many inquiries in all sections in regard to the possibilities of American markets. The presence of U.S. commercial authorities at the Birmingham Fair this year is generally regarded as a welcome innovation. The stand has an illuminated sign, " U.S. Markets ".

Mr. J. Leek, president of the Birmingham Chamber of Commerce, responding to the opening speech of the Lord Mayor of Birmingham at the inaugural function, said it was clear to those who had travelled that Britain was expected to recover.

Mr. J. M. Tully, Agent-General for New South Wales, who also responded, uttered a warning about German competition. He said he had been in Germany and had been astounded at the progress made, particularly in engineering. German firms were visiting all parts of the world, including Australia, and he could see the possibility of a great danger to British industries from that source. While there was undercutting of pay and longer hours were worked, Germany was going to be a great source of danger.

INCLUDED in the exhibits of Wild-Barfield Electric Furnaces, Ltd., in its range of horizontal general purpose furnaces, there is one particularly suitable for heat treatment at temperatures up to 1050° C. (1922° F.). This range has been designed to meet the demands of a production schedule for which the smaller light duty furnace is inadequate, and the full-scale production furnace not economical.—**Stand C321 and C220.**

* * *

THE " B-W " vacuum and pressure impregnating plants of Barlow-Whitney, Ltd., are self-contained, occupy little floor space, and are easily moved, the company claims. A single autoclave unit is displayed, with storage tank, vacuum pump and compressor set, etc., and designed for varnish, wax or compound impregnation.

The company's hot oil circulators, with built-in circulating pumps, are used for heating extrusion machines, large platens, wax and bitumen troughs, vulcanising presses, jacketed pans and autoclaves, etc., which were originally designed for steam heating. Temperatures up to 500°F. and over are possible. Duplex types for circulating hot and cold oil are manufactured for rapid cooling.—**Stand C210, Birmingham.**

* * *

A MORE robust model of the 14B dumper and a loader of greatly increased versatility are shown by E. Boydell & Co., Ltd., manufacturers of Muir-Hill equipment. The 14B dumper, claimed to withstand the worst of working conditions, is fitted with a 60 h.p. diesel engine.—**Stand 1301 and 1200.**

* * *

SOME EXAMPLES of a wide range of products manufactured by Fredk. Braby & Co., Ltd., for the chemical, oil, food and agricultural industries are displayed. They include steel drums, perforated metals, aluminium products, galvanised corrugated cisterns, industrial wirework and examples of metal platework. A Gooseneck elevator, which is made by a subsidiary company, the G.C. Engineering Co., Ltd., for use in the food industry, is shown in operation.—**Stand B611 and 508.**

* * *

THE Atomill high speed fine grinder, suitable for reducing a wide variety of friable and fibrous materials to products between 3-in. and 300-mesh, is being featured on the stand of **British Jeffrey-Diamond, Ltd.** The most recent addition to this firm's range of crushing, pulverising and grinding machines is the Midget Atomill. This machine, although originally designed for laboratory work, is claimed to be robust enough for small batch production.—**Stand D526.**

* * *

THE "PYROBAR" heating element, manufactured by **The British Thomson-Houston Co., Ltd.**, is said to offer a safe and convenient method of heating by electricity. It consists of a resistance spiral solidly embedded in magnesium oxide and protected from mechanical damage by an outer sheathing. For most applications, the heaters are suitable for direct immersion into liquids and soft metals where chemical action does not affect the tube. They cover a range of temperatures up to 900°C., and units for a wide variety of applications are exhibited.—**Stands C511 and C410.**

* * *

GUIDANCE on the choice of materials to meet the most exacting conditions is available to the chemical engineer from the technical services of the **Copper Development Association.** A great deal of metallurgical data on the casting and working of copper and copper alloys is available, and about 40 technical publications are issued free.—**Stand D230.**

* * *

FOUR important branches of industrial ceramics—chemical stoneware, laboratory and technical porcelain, porous ceramic media and filter units, and electrical porcelain—are represented on the stand of **Doulton & Co., Ltd.** The centre piece of the exhibit consists of a large absorption tower connected to a 200-gallon reaction vessel by socket and spigot piping. The tower is fitted with a distributing plate, perforated plate and tower packing. The centre cylinder is provided with a glass inspection opening which enables the scrubbing effect inside the tower to be observed. —**Stand D743 and 642.**

* * *

AS AN example of the gas-fired equipment used in industry, **The Gas Council** stand shows a working model (quarter-scale) of a vertical slot furnace for tube and bar heating. The furnace, manufactured by the Incandescent Heat Co., Ltd., Smethwick, Birmingham, is for the heat treatment or re-heating of metals at temperatures of up to 1000° C. It can treat tubes, bars, sections or strips, in quantities up to 10 tons per hour.—**Stands D639 and 538.**

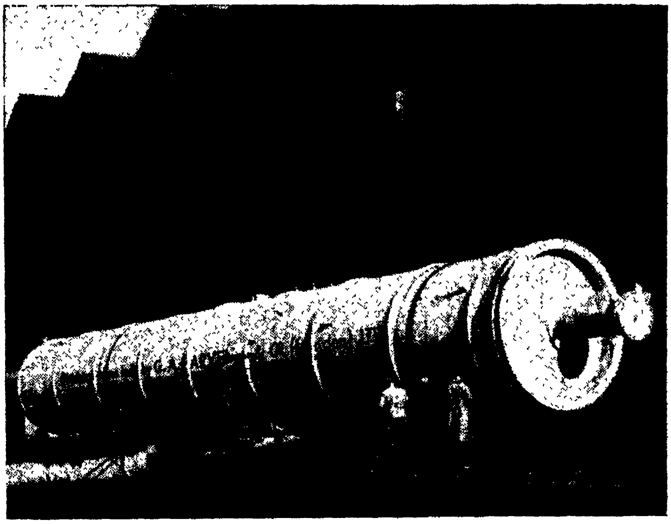
* * *

IN ADDITION to the heavy plant and equipment which is manufactured by **G. A. Harvey & Co., (London), Ltd.**, for the oil industries, the company produces pressure vessels, autoclaves, etc. Some of these and other examples of sheet metal working are shown by the use of photographs.—**Stand B329.**

* * *

THE exhibit of **The General Electric Co., Ltd.**, is divided into three parts, dis-

The problems of showmanship at Castle Bromwich were complicated by the fact that much modern equipment of chemical processing is too massive to house in any exhibition hall. Many firms adopted the photographic method of representation, of which this example was G. A. Harvey's illustration of part of the distillation equipment produced for the new Shell refinery at Stanlow



playing airport lighting equipment, street lighting equipment, and motors, motor control gear and accessories. From the large range of motor production, the G.E.C. is featuring a display of motors for the textile industry; steelworks; motors; a.c. and d.c. industrial motors of all types; motor starters; and electronic equipment for motor control.—**Stands C503 and 402.**

* * *

A NEW neutral heat-treatment salt for use in the range 720-950° C. is demonstrated at Castle Bromwich by the General Chemicals Division of IMPERIAL CHEMICAL INDUSTRIES; LTD. Several trichlorethylene degreasing units are also installed for normal working.—**Stands D315/D212.**

* * *

SPECTROGRAPHIC methods for the analytical control of its products are being shown in a working laboratory unit by the Metals Division of IMPERIAL CHEMICAL INDUSTRIES, LTD. Other features include: the method of laying Kuterlon copper tubes for underground water supplies by means of the mole drainage plough illustrated by photographs and model; and a half-section of double purlin roof built up from channels, angles and corrugated sheet in aluminium alloys.—**Stand D409/308.**

* * *

A SMALL scale model of a modern metal pre-treatment plant is the central exhibit of JENOLITE, LTD. It consists of four tanks; a degreaser, two rust preventative tanks and a hot rinse tank. New products include a paint stripper (PS5) and an aluminium keying solution (AKS), claimed to provide a perfect keying surface for aluminium panels. Only one cold brushing is needed.—**Stand B221.**

* * *

AMONG the instruments shown by LONDEX, LTD., are timers for welding, heating, moulding, curing, ageing and other processes. The company's range of timers comprises condenser-discharge instruments to measure 1/10 to 10 sec.; synchronous instruments to time periods of a few seconds to one week or more, with an accuracy of 0.2 per cent; and cam-type instruments to control a complex sequence of operations. Liquid-level control equipment is represented principally by a working Lectralevel apparatus. This automatically fills, empties or maintains the level in a tank, without the use of a float or moving parts in the liquid. Flow indicators, manufactured by Londex, measure the flow of liquids, such as cooling water and lubricating oil. They can be arranged to maintain a lamp flickering during flow, to give a warning, shut down a machine, start a motor or start stand-by equipment, should flow cease.—**Stand 724.**

* * *

STATIONARY cells for emergency lighting is a prominent feature of PRITCHETT & GOLD AND E.P.S. CO., LTD., stand at Castle Bromwich. The exhibits range from a small cell of 10 a.h. capacity, weighing less than 10 lb., to one of 400 a.h. capacity, weighing more than 2 cwt.—**Stand C702.**

[Courtesy of Sigmund Pumps, Ltd.

Sigma vertical glandless acid pump type WA-N fitted with intermediate bearing

THE wide application of diaphragm valves to serve many chemical processes is being demonstrated by the SAUNDERS VALVE CO., LTD. The expansion of types reflects the large increase in the number and character of liquids employed in industry. To cope with this the company is offering many diaphragms and special bodies—the only other vulnerable part of the valve—in grey or malleable cast iron, in stainless steel, acid resisting bronze or aluminium, or bodies in cast iron, lined with rubber, glass or lead. Pressure operation by remote control is being demonstrated with both piston and air motor operated valves and examples of the various other means of actuation, e.g., handwheel, lever (quick action) extended spindle and chain wheel are being shown. For handling viscous liquids the Type "K" valve with straight-through, full bore provides a practical solution.—**Stand D129.**

* * *

IN an exhibit comprising many different types of centrifugal pumps for industrial,

(*continued at foot of next page*)

A NEW INDUSTRIAL CHEMICAL

Developing Production of Effective Hydrazine Carrier

THE crystalline, colourless salt, dihydrazine sulphate, is now being produced in commercial quantities for applications requiring the use of hydrazine. It offers some advantages over the more famliar hydrazine acid sulphate as it requires only half as much base to free an equivalent amount of hydrazine and contains 60 per cent more hydrazine. It has a much greater solubility in water.

Dihydrazine sulphate ($(N_2H_5)_2SO_4$) is a stable compound and in the dried form has a melting point range of 107-112°C.; if the temperature is increased to 180°C. decomposition takes place with evolution of gas. The salt is freely soluble in water and a 1 per cent solution has a *p*H range of 4 to 5 at 25°C. The sulphate is hygroscopic and when exposed to moisture forms the monohydrate.

The greatest use for dihydrazine sulphate is undoubtedly as a carrier for hydrazine. This base is formed when the sulphate is dissolved in water and the *p*H of the solution so adjusted as to free the hydrazine. This free hydrazine is then available for reactions such as the Curtius reaction for making isocyanates, amines, symmetrical ureas and urethanes from esters.

Other typical hydrazine reactions include the Wolf-Kishner reaction for reducing carbonyl groups to methylene groups or to carbon chains; reaction with active halides to form substituted hydrazines and reaction with carbonyl compounds to produce hydrazones or azines. The preparation of semi-carbazide and amino-guanidine is based on free hydrazine ($NH_2.NH_2$) which can also be utilised for the formation of heterocyclic rings, *e.g.*, production of isopyrazoles from diketones.

Apart from the use of dihydrazine sulphate as a carrier for hydrazine, it has several direct applications, *e.g.*, U.S. Pat. 2,485,537 discloses the use of the sulphate as a catalyst for the polymerisation of vinylidene fluoride. Dihydrazine sulphate appears to offer some promise as a pesticide and herbicide. It is also recommended as an additive for improving the keeping qualities of cut flowers; for photographic purposes and for silvering mirrors by instantaneous reduction of ammoniacal silver nitrate solution on the glass surface.

Dihydrazine sulphate is a toxic and corrosive substance and must be handled with care. Any salt which comes in contact with the skin should be immediately washed off and if irritation is caused, the affected part must be treated as for acid burn. Exposure to fumes is dangerous.

CHEMICAL ENGINEERING AT BIRMINGHAM

(*continued from previous page*)

fire fighting, and agricultural duties, Sigmund Pumps, Ltd., has as its main feature a representative vertical glandless acid pump. This is designed to deal with acids in heavy concentrations and is being shown for the first time. A feature is that the liquid does not come into contact with the stuffing box, a by-pass branch being fitted immediately above the bearing to prevent the liquid rising in the column. Bearings are lubricated by the liquid handled by the unit, all parts subject to attack by the acid being composed of, or protected by, acid-resistant material.—**—Stand D337.**

* * *

BATTERIES designed for a large number of specialised fields, including power stations, telephone exchanges and other large-scale undertakings, emergency lighting, electric vehicles, ships, etc., are being shown on the stand of the Tudor Accumulator Co., Ltd.—**Stand C109.**

THE INDOOR stand of Thos. W. Ward, Ltd., displays photographs of the group's operations, including factory planning and installation work, industrial dismantling, scrap handling, erection of structural steelwork, etc. A series of pictures shows famous fighting vessels being broken up for scrap. The outdoor stand displays sheet metal working machinery, woodworking machinery, pumps and compressors, and some of the "Polford" range of foundry plant.—**Stands D719 and 1360.**

* * *

FABRICATED flanged pipework for pressure purposes, panels for panel heating and a selection of mild steel spiral wound gilled tube are some of the exhibits of the Wellington Tube Works, Ltd. Several of the company's Weldex heaters are exhibited, capacities varying from a small unit heater to a heavy duty plenum, including a gas-fired unit heater for space heating and a selection of convectors.—**Stand C300.**

IMPRESSIONS OF THE 29th B.I.F.

THE GROWING EMPLOYMENT OF PLASTICS

IN the plastics section at Earls Court there are 46 exhibitors, compared with 53 last year, 71 in 1948 and 80 in 1947. The area of the floor space this year is 12,481 sq. ft., against 20,297 in 1949, 25,151 in 1948, and 21,400 in 1947. One of the stands (R2 and 38) is sponsored by the **British Plastics Federation**, which has staged a composite exhibit of the products of its 16 constituent members. The exhibits in this section range through the whole field of plastics raw materials to a multiplicity of finished articles.

A reporter of The Chemical Age obtained from a number of representative stands a cross-section of opinion on the position of plastics raw materials and the trade generally. On one stand it was stated that supplies of most raw materials are fairly satisfactory. Demands for nearly all moulding powders are being met quite comfortably, and the same applies to synthetic resns.

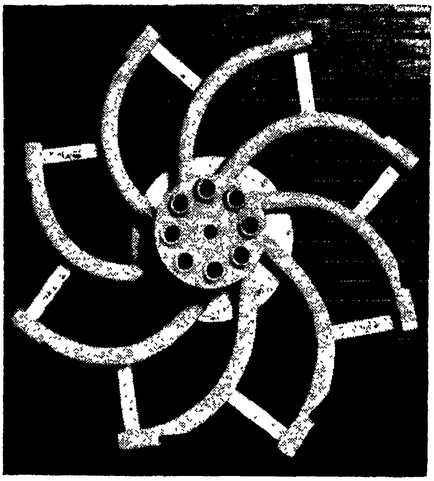
A particular shortage is in PVC, said this exhibitor, principally on account of the growing number of uses, and the large quantities being employed for the manufacture of certain articles, for example ladies' mackintoshes. In this connection it is interesting to note that plastic mackintoshes can now be bought for 15s. Electric cables still form the chief outlet for PVC, but very large quantities are also used in the motor car industry. Most of the cars now being exported are upholstered in leather cloth made from PVC.

Widened Need of PVC

The fairly satisfactory supply position of most moulding powders, synthetic resins, and other plastics raw materials was confirmed by several more exhibitors, who spoke, however, of the scarcity of PVC in relation to the demand for an ever increasing field of uses, illustrated by numerous articles displayed on their stands. Among its trade uses so illustrated are rigid PVC tubing for chemical plant, PVC sink traps for chemical laboratories, sections of cable sheathing, rigid PVC sheet for linings.

* * *

ON the stand of **British Celanese, Ltd.**, is displayed representative articles fabricated from Celanese plastics, including Celastoid sheeting, extrusions in the form of rods, tubes and other engineering sections, and moulding powders; Clarifoil film for "vision packaging"; and Cinemoid special non-flam sheeting for lighting



(Courtesy of I.C.I., Ltd.

The latest use of plastics in industry, a metering wheel in Alkathene (Rediweld, Ltd.) with high resistance to the hydrofluoric acid it measures and controls

effects, etc. A range of Celanese fabrics is also shown. Coinciding with the BIF and continuing until June 16, British Celanese, Ltd., is holding an exhibition of its plastics and some of their applications, from Monday to Friday each week from 10 to 5 p.m., at Celanese House, Hanover Square, London, W.1.—Stand R12.

* * *

A FULL range of cellulose acetate plastics, in the form of moulding powders, extruded sections, and films (marketed separately by British Cellophane, Ltd.) is made by **Courtaulds, Ltd.**, and exhibited on its stand. The moulding powders are shown in a wide range of colours, from crystal to black with numerous translucents. Powders are produced in a range of hardnesses to suit customers' requirements, and are graded according to their flow temperatures. Courtaulds powders are stated to be made from virgin flake, which is blended for consistency and specially stabilised to prevent burning at the moulding temperatures. Dyes and pigments are tested for heat break-down and fastness to light and migration. On this stand is an attractive red ribbed floor covering in a Courtauld plastic material. Early delivery can be given of all

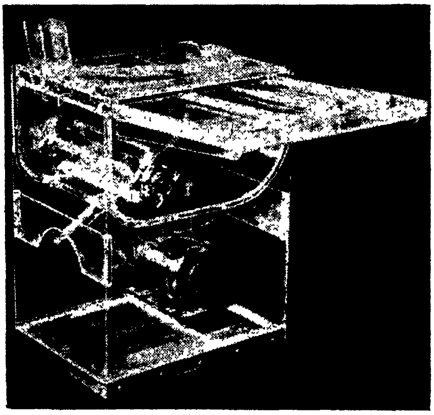
Courtaulds plastics products. Most powder can be supplied immediately and in most shades.—**Stand R10.**

* * *

AMONG the firms exhibiting on the combined stand of the British Plastics Federation in the Earls Court section are THOMAS DE LA RUE & CO., LTD., (Plastics Division) and DE LA RUE EXTRUSIONS, LTD., showing samples of Formica for use as a decorative surface, and models of building interiors where this material has been used for renovations. Uses of extruded materials are demonstrated by a number of finished articles. The De La Rue stand at Birmingham is entirely devoted to the industrial uses of plastics. Among these Delaron and Traffolyte engraving and interlaminate printed materials are shown, and a number of examples of their uses in constructional and electrical work.—**Stand R2 and R33, Earls Court, and D612, Birmingham.**

* * *

THE exhibit of I.C.I., LTD., is planned with the outside of the stand forming an index to the plastics materials made by the company shown in the form in which it sells them—powder, sheet, etc. Inside the stand are displayed representative examples of finished articles made from these materials. Here one is reminded, for example, of the use of Perspex sheet for fluorescent light fittings in industrial and domestic locations, and for street lighting. Also shown here, made in Perspex, are globes and refractor plates for sodium lighting installations, motor-car dashboards, shatter-proof side windows, radio set dials and cabinets, implosion guards for television receivers, sewing machine tops, and numerous advertising signs and fancy goods. Samples of corrugated Perspex are shown, and in this product one is reminded that I.C.I. is well ahead of American manufacturers. Industrial inspection lenses in Transpex are also in this comprehensive display.



[Courtesy of I.C.I., Ltd.

A successful further use of Perspex is the new type of photo-engraving etcher (D. O. Nicol, Ltd.), highly resistant and relatively easily produced because of the machinability of the material

On the I.C.I. stand are many examples of the uses in the chemical trades and pharmacy of plastics. A novel example is a squeezable bottle in polythene. Alkathene film is attracting attention as a packaging material. Many other examples of plastics uses are on this stand, including brushes tufted in nylon, tennis rackets stringed with nylon, and numerous laminated applications.—**Stands R11 and R33.**

* * *

A FULL range of improved patterns of BSS ground glass joints, first introduced last year, is being exhibited by JAMES A. JOBLING & CO., LTD., among its standard laboratory and scientific glassware. Also included in the exhibit are representative examples of the firm's Pyrex brand industrial and lighting glassware.—**Stands S17 and S24, Earls Court.**

* * *

AN interesting example of the many established uses of plastics is to be found on the stand of HORN FLOWA, LTD. Here are buttons which are stated to withstand heat and chemical cleaning and do not bend or go soft in hot climates. It is also claimed that they can be stored indefinitely without fear of damage from rats and other vermin.—**Stand R26.**

* * *

AMONG the stands exhibiting plastics finished articles is that of the TRIPLEX SAFETY GLASS CO., LTD., a fabricator in Perspex. Displayed are numerous examples of lighting and domestic fittings, such as wash basins, for locations such as caravans, where lightness is an essential.—**Stand R20.**

* * *

TACKINESSS and cracking are claimed to have been overcome in the new flexible plastics, Fortiflex, based on vinyl resins, which are being shown by DUNLOP SPECIAL PRODUCTS, LTD. Many types of plastic sheeting and extrusions with a wide range of applications are manufactured by the company.—**Stand R16, Earls Court.**

Progress of German Apparatus and Instruments

Scope of the First Post-War Exhibition

THE German exhibition of scientific and industrial instruments and apparatus, the ACHEMA, was before the war a leading event in the industrial life of Germany. It appealed not only to chemists and engineers, but to practically all sections of industry and agriculture. The exhibitions were held about once every four years, and had made remarkable progress in size and importance, ACHEMA VIII in 1937 having 410 exhibitors and 108,000 visitors. This year's exhibition in Frankfurt (July 9-16), the first for 13 years, promises to equal that of 1937 in the number of exhibitors, and the attendance may well be larger.

The promoters are mainly the DECHEMA—Deutsche Ges. für Chemisches Apparatewesen — with which are collaborating this year the German engineering and iron and steel societies, the VDI and the VDEh.

Fruitful Research

It is expected that the exhibition will provide a revealing indication of the relatively rapid recovery in most fields of the German chemical and allied industries and represent the fruits of much research and invention. A preliminary survey shows that there will be much that is new and of technical value and scientific interest. Of the great halls in the Frankfurt exhibition buildings, Nos. VII and VIII—the two largest—will doubtless attract special attention. In the former will be housed complete plants for oil and fat refining, milk and fruit processing, metal working, manufacture of cement, sulphuric and nitric acids, fertilisers, nitrogen fixation, petroleum- and coal-chemicals, synthetic resins, and chemical specialities, such as salicylic acid, Salvarsan, formaldehyde, formic acid, etc. Important developments are said to have been made in separator plant, in the design of centrifugals and extractors.

Large-Scale Separation

These separators, evolved from the old type centrifugals and used for clarifying, purifying and the like, have double- and multi-chamber drums. In the latest type shown, occupying small space, the drum capacity is 70 litres and they are said to treat 4500 litres per hour in three-stage extraction. This is secured by establishing extraction equilibrium between solvent and crude material to be treated within a fraction of a second, since the separated liquids in one (centrifuging) stage are again mixed before the next stage.

Stainless steel is used for parts exposed to corrosive action, protective atmosphere for the interior. There is complete removal and recovery of the extraction medium, and the improved safety drive is said to eliminate the risk of explosion.

Important improvements are said to have been made in high vacuum technique, which is being increasingly used for distillation, drying, impregnating, in vacuum metallurgy—a very promising new field—and in other chemical and allied processes. New materials and new designs have had to be used in components: pumps, valves, joints, as well as in the new means of measurement and control.

Ultrasonics

Improved ultrasonic apparatus is to be shown for preparation of emulsions and suspensions, and for atomising liquids. For thermoplastic work containers up to 2 m. diameter are being used, heated by induction, the coils being inserted direct in circuit so that some 95 per cent of the current is converted into heat for the container jacketing. This ensures shorter heating time, better production, and more efficient temperature control.

A series of lectures will be given at the exhibition by authorities in their respective fields, and these, too, will describe many new lines and developments likely to be of scientific and practical value. Some details of these have been given in the ACHEMA Year Book, recently issued in connection with the exhibition. Among the subjects to be dealt with are: a new method for calculating (designing) clarifiers and filters; microfilm technique in the chemical industries; high vacuum processes; a new flame photometer; optical instruments; glass apparatus; new apparatus for high frequency work; new method and apparatus for determining carbon oxides, methane and hydrogen sulphide; improved filter-paper; developments in X-ray tests; improved forms of thermal control.

In the series of lectures on works practice and chemical engineering generally there appear to have been a number of innovations in the scope of liquid extraction, drying, filtration and emulsification.

DRUGS AND FINE CHEMICALS IN 1949—VI

Sources of Vitamin B_{12}

By G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

TURNING first to established fermentation processes, the Merck group found the factor was produced by *Streptomyces griseus* and was present in the fermentation liquor. This organism is used in the large-scale production of the antibiotic, streptomycin (Rickes *et al.*, *Science*, 1948, *108*, 684).

During recent weeks Glaxo Laboratories have offered Vitamin B_{12} from microbiological sources in the U.K. The preparation is marketed under the brand name Cytamen and one cc is equivalent to 20 micrograms Vitamin B_{12}, microbiologically standardised. A preparation from such a source is particularly valuable for administration to patients who have become sensitised to liver extract, a not infrequent occurrence.

It is highly probable that the Vitamin B_{12} from liver and *Streptomyces griseus* are identical (Dunlop, *Lancet*, 1949, *1*, 954). There appears to be another form of Vitamin B_{12} present in liver, which is obtainable from *Streptomyces aureofaciens*, the mould-like organism which produces the antibiotic aureomycin. This form differs from Vitamin B_{12} in its absorption spectrum (Pierce *et al.*, *J. Amer. Chem. Soc.*, 1949, *71*, 1514; 2952) as determined in the Lederle laboratories and this factor has been designated Vitamin B_{12b}.

Other hæmatopoietic factors in liver other than B_{12} and B_{12b} may well exist. Indeed, Lester Smith and his colleagues believe it probable that there are such additional factors (Lester Smith *et al.*, *Nature*, 1949, *161*, 638; *Biochem. J.*, 1949, *44*, v; *Brit. Med. J.*, 17/12/49, 1369).

Chemical Modifications

It is not known, however, whether or not these substances incorporate B_{12} in the molecule much in the same way as folic acid forms active conjugates with glutamyl residues (see earlier annual reviews), or whether they are chemical modifications of B_{12} such as occur in the penicillin series.

Vitamin B_{12a} is an active hæmatopoietic agent (that is one affecting the production of blood cells by the marrow), but less so than B_{12}; B_{12a} is produced artificially from B_{12} by catalytic hydrogenation (Kaczka, *J. Amer. Chem. Soc.*, 1949, *71*, 1514).

Intensive studies are proceeding on the chemical structure of Vitamin B_{12} and it has already been established simultaneously in the U.S.A. and the U.K. that the molecule contains cobalt. This metal has not been found previously in pure substances of biological origin.

The formula for Vitamin B_{12} has been tentatively suggested by Brink *et al* (*J. Amer. Chem. Soc.*, 1949, *71*, 1854) as:—

$$C_{61-64}H_{86-92}N_{14}O_{13}P\,Co$$

In common with the vitamin, riboflavin (a member of the Vitamin B complex), Vitamin B_{12} contains the 5:6-dimethylbenzimidazole nucleus (Holiday, *J. Pharm. Pharmacol.*, 1949, *1*, 784; 957) which is released by drastic acid hydrolysis. Folkers came to a similar conclusion independently as announced at the First International Congress of Biochemistry at Cambridge in August, 1949.

Polyacidic Base

Vitamin B_{12} has also been shown to be a polyacidic base (*J. Amer. Chem. Soc.*, 1949, *71*, 1951), the basic groups being weak, and it has been suggested that it may not be a polypeptide but may contain a pyrrole or porphyrin structure.

The molecule is readily inactivated by treatment with cold acid or alkali, from which it may be deduced it possesses a readily hydrolysable group or linkage which is essential to its biological activity. Long heating with acid liberates a substance giving the ninhydrin reaction (ninhydrin or triketohydrindone hydrate is a specific reagent for α-amino acids) but the greater part of the molecule still containing the cobalt remains intact.

Drastic treatment with alkali releases pyrole-like substances and it is interesting to note that chlorophyll behaves in a similar way under such treatment.

Ellis *et al* (*J. Pharm. Pharmacol.*, 1949, *1*, 950) have indicated that the ninhydrin-reacting substance thus produced from Vitamin B_{12} chromatograms in a similar manner to 2-aminopropanol; it is not to be concluded, however, that there is an identity as a consequence.

In the light of present knowledge it has been suggested (*Pharm. J.*, 10/9/49, 194) that the formula for Vitamin B_{12} may provisionally be considered to be:—

$$(CH3)_2.C_6H_2.N:CH\,NH.C_{53-54}.H_{77-81}.N_{12}.O_3.P.Co.$$

The fact that Vitamin B_{12} contains the 5:6-dimethyl-benzimidazole nucleus is of great biogenetic interest (Beaven *et al.* *J. Pharm. Pharmacol.*, 1949, *1*, 957). Riboflavin which contains the 4:5-dimethyl-o-phenylenediamine nucleus is known to be synthesised by microbial flora in the rumen of sheep and this flora utilised at least a part of the cobalt ingested by the ruminant.

Cobalt Deficiency

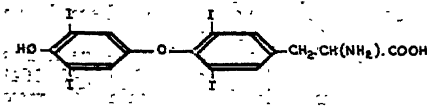
Wasting diseases in animals which result from grazing cobalt-deficient pastures are due, it has been suggested, not to the animal requiring cobalt as such, but to the animal requiring bacterial anabolic substances containing cobalt. At the same time, it has been found that Vitamin B_{12} administration causes no favourable response in cobalt-deficient lambs, which otherwise respond readily when cobalt itself is fed orally.

On the basis of these findings, Vitamin B_{12} would appear to play no part in cobalt deficiency in lambs; but the authors find it difficult to avoid drawing the conclusion that cobalt plays a part in Vitamin B_{12} synthesis. They consider that interesting experimental work is bound now to develop in this field.

An observation which is puzzling in the same degree is that of Bethell *et al.* (*J. Clin. Med.*, 1948, *33*, 1477) who found that fæces of untreated pernicious anæmia patients contain Vitamin B_{12} or some other factor which stimulates growth of *Lactobacillus lactis* in the same way. The factor was present in the fæces in an amount greater than would have been required to cure pernicious anæmia in the patient.

The functions of folic acid and Vitamin B_{12} in anæmia were also discussed in a symposium at the British Association meeting at Newcastle in 1949 (*Nature*, 1949, *164*, 986). There can be little doubt that 1950 will provide further knowledge of the character and use of Vitamin B_{12}.

Another interesting development during 1949 has been the rational and economic synthesis of the active isomer, l-thyroxine (Beta - [3:5-di-iodo - 4(3′:5′-di-iodo-4′-hydroxyphenoxy) - phenyl] - alphaaminopropionic acid).



The lævo-isomer of this iodinated amino-acid is about twice as active as the racemic mixture.

Thyroxine may be obtained from the thyroid gland or by synthetic means. The main function of the thyroid gland is, of course, to regulate the body's metabolic rate and its growth and development. Thyroxine, itself, is the actual hormone although it is conjugated in the gland with a globulin, in which form, as well as in the form of a peptide, it also exists in extracts.

The structure of thyroxine was elucidated by Harington in 1926 (*Biochem. J.*, 1926, *20*, 293; 300) and the substance was synthesised by him and Barger in 1927 (*Biochem. J.*, 1927, *21*, 169). Synthetic routes have, hitherto, been too costly to provide a supply of the hormone and resort has been made to thyroid extracts which are the subject of a B.P. monograph (1948, p.562).

These extracts have been widely used in control of dysfunction of the thyroid gland, as, for example, in myxedema. This is a form of hyperthyroidism characterised by smallness of the gland, swelling of face and hands, slowing of pulse rate and general retardation of the rate of basal metabolism. There are other miscellaneous uses of the glandular extracts.

It has never proved easy to standardise these gland extracts, so that the availability of the pure hormone at an economic price is of outstanding convenience.

The recent synthesis has been achieved by Hems and his co-workers and has been reported in a classical paper in the *Journal of the Chemical Society*, 1949, 3424. This work has also been summarised by Hems and Eks (*Pharm. J.*, 31/12/49). It was also the subject of a paper by Hems read before the Fine Chemicals Group of the Society of Chemical Industry in London, in December, last year.

Synthesis Problems

The two principal difficulties in synthesis were associated with the formation of the di-iododiphenylether grouping and the inconvenient synthesis of the alanine side chain from a nitro group.

In Harington's synthesis, 3:4:5-tri-iodonitrobenzene was first condensed with p-methoxyphenol and then, through a series of some five or so stages, the nitro group in the former compound was converted to the alanine side-chain and the molecule otherwise appropriately modified by iodination and demethylation.

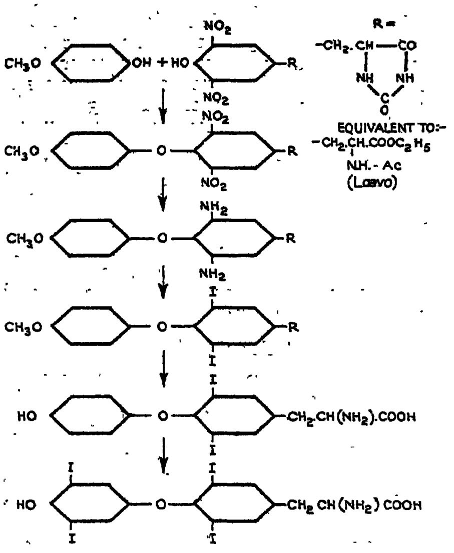
Hems' approach has been made from a derivative of tyrosine, already containing the alanine side-chain in the molecule.

The first step in Hems' synthesis was the elaboration of a general method of preparing diphenylethers from dinitrophenols.

The second major step was the use of 3:5-dinitrotyrosine. This, despite statements to the contrary in the literature, was found to yield di-iodo compounds from the diaminodiphenyl ether prepared from it, so long as the reaction was carried out in anhydrous conditions.

Successful synthesis of dl-thyroxine was achieved from dinitro-dl-tyrosine hydantoin and subsequently it was found that the naturally occurring thyroxine isomer could be synthesised by using 3:5-dinitro-N-acetyl-l-tyrosine ethyl ester.

Various steps in the synthesis carried out in the Glaxo Laboratories (which is the subject of a pending patent) were as follows:—



Steady progress continues in the antibiotics field and 1949 has proved a period of consolidation and extension of knowledge of established discoveries in the field.

Penicillin and streptomycin continue to carry the main interest while knowledge of the latter, especially in the treatment of certain types of tuberculosis, continues to expand.

Streptomycin, by contrast with penicillin, was essentially a U.S. discovery and manufacture in this country has somewhat lagged.

Manufacture was, however, begun in mid-1948 by Glaxo Laboratories, which has since developed its process. All production up to November, 1949, was sent to hospitals designated by the Ministry of Health. Since that date streptomycin has been freed for use in general practice.

Streptomycin, including related substances such as dihydrostreptomycin, remain subject to the provisions of the Penicillin Act of 1947 by virtue of the Streptomycin Regulations of 1948 (S.I., 1948, No. 1735) and it is, therefore, available on prescription only.

No substantial demand has developed in general practice since the conditions in which streptomycin is more particularly indicated require hospitalisation, partly because of the character of the infections, but also because of the need for repeated administration and the risk of inducing streptomycin resistance by improper treatment.

It has been generally assessed as a generally more harmful and less potent therapeutic agent (*Brit. Med. J.*, 12/11/49, 1098) requiring commensurate caution in its use.

So far as manufacture of streptomycin is concerned the fermentation section broadly follows procedures established in penicillin production. *Streptomyces griseus*, however, requires its nitrogen supply in the form of meat extract, as compared with the relatively cheap and more accessible corn steep liquor required by *Penicillium*.

Adsorption Process

The extraction section of the process, however, differs from the corresponding stage in penicillin manufacture in that the latter is isolated essentially by a series of solvent extraction operations (see earlier annual reviews) whereas streptomycin production involves a series of adsorption procedures. The antibiotic is first isolated as its hydrochloride, which is then converted to its calcium chloride salt.

The most important field of application of streptomycin is in the treatment of certain types of tuberculosis, especially the miliary form of the disease.

Effective use in pulmonary tuberculosis, however, calls for a nice judgment, as there is a stage in the progress of the disease when it can be used with optimum effect. It must then be used efficiently, as otherwise there is a risk of developing streptomycin-resistance with enhanced danger to both patients and contacts.

Indeed, as pointed out in earlier annual reviews, it has been demonstrated that the fantastic transformation can occur of streptomycin, the growth inhibitor becoming an essential growth factor for the same organism.

Hope exists that the mainly neurotoxic

side-effects so characteristic of streptomycin therapy may be minimised or obviated by the use of dihydrostreptomycin, which is now being manufactured in this country and offered in the form of the sulphate.

Supplies of this derivative, however, are so small that, up to the end of 1949, at least, they were restricted to hospitals. Unfortunately, resistance appears to develop equally readily with dihydrostreptomycin as with the parent antibiotic and resistance to the one means resistance to the other.

No Maltol Yield

Dihydrostreptomycin is produced by the catalytic hydrogenation of crystalline streptomycin. It is said to be chemically and pharmacologically distinct from streptomycin (the Merck Report, —/1/49, 25). It is not inactivated by cysteine or carbonyl reagents and does not yield maltol by the action of alkali. Allergic manifestations are much less likely with dihydrostreptomycin than with the parent substance.

Conn & Norman (*J. Clin. Invest.*, 1949, *28*, (5), 837) describe an amperometric method for the estimation of streptomycin and dihydrostreptomycin depending upon their ability to form water-insoluble salts with various antonic dyes.

A method for the determination of dihydrostreptomycin based upon the formaldehyde liberated by periodate oxidation of dihydrostreptomycin is described by Garlock and Grove (*J. Clin. Invest.*, 1949, *28* (5) 843).

Periodate oxidation is a general method for clearing the linkage between two adjacent hydroxyl bearing carbon atoms and if one of the hydroxyl groups is a primary carbinol, formaldehyde is produced. The formaldehyde released was titrated with chromotropic acid after distillation.

Following earlier research, the Medical Research Council has undertaken clinical trials of p-aminosalicylic and streptomycin. These trials were commenced in 1948 and a preliminary report was issued last year (*Brit. Med. J.*, 31/12/49, 1521).

The tuberculostatic properties of p-aminosalicylic acid were first reported by Lehmann in Sweden in 1944. It is interesting to observe that so simple a synthetic substance, in contrast with many more complex ones which have been tried, should be found to be so effective in this intractable disease.

Especially is this notable when it is remembered that this same drug has growth promoting effects with some microorganisms.

Broad results of the trials with p-aminosalicylic acid have been so encouraging that it has been found worthwhile publishing a reserved preliminary report, even though the tests are not completed. The object was to assess the clinical effect of both p-aminosalicylic acid (PAS) by itself and in combination with streptomycin in the treatment of tuberculosis.

Investigations have been carefully controlled and restricted to specially diagnosed cases of pulmonary tuberculosis of recent development which were unsuitable for collapse therapy.

The reason for trying the combination of streptomycin with PAS was to confirm earlier reports that the combination was advantageous in that the addition of a second tuberculostatic agent might be sufficient to suppress any streptomycin-resisant organisms which might be present.

At the present juncture, the tests show that the combination suppresses the development of streptomycin-resistant strains of tubercule bacilli during the six months following the start of the treatment.

The terms of this preliminary report are admirably cautious and further details of the trials will be awaited with interest. Incidentally, there seems to be a synergistic effect between streptomycin and PAS which is independent of any question of averting the development of streptomycin-resistance, but this still awaits final confirmation.

"Promizole"

Combined therapy with other tuberculostatic drugs is naturally being widely explored by workers in this field; but it has been found that "promizole" (2-amino-5-sulphanilyl-thiazole) in combination with streptomycin did not reduce the incidence of the emergence of streptomycin resistance.

p-Aminosalicylic acid is being manufactured by Therapas, Ltd. (a company jointly operated by Herts Pharmaceuticals, Ltd., and British Chemicals and Biologicals, Ltd.) and it has been stated that the cost of treatment per patient per week with PAS would be reduced to 5s. with the large-scale manufacture now about to be undertaken (*Chem. & Dr.*, 7/1/50, 12). For further information on manufacture, readers are referred to B.P. 636, 333 and B.P. 636, 331. PAS is also manufactured by other firms.

Following the work of Domagk (e.g., *Amer. Rev. Tuberc.*, 1950, *61*, 8; *Naturwiss*, 1946, *10*, 315) p-acetylaminobenzaldehyde thiosemicarbazone is also now available in the U.K. for clinical trials in tuberculosis.

(To be concluded)

Technical Publications

TRAINING of a Chemist, the presidential address of T. S. Wheeler delivered in Dublin last year, is reproduced in the *Irish Chemical Association Journal.* Other papers included are the guest lecture on "Plant Viruses" delivered by Miss Phyllis E. M. Clinch and "The Biological Significance of Steroid Compounds" by Dr. W. J. E. Jessop.

* * *

AN undesirable custom of calling reactions, even those which are uncommon, by the name of the discoverer, has grown up in recent years. In an effort to overcome the obscurity thus caused, notes when reading literature were made by Prof. T. S. Wheeler (professor of chemistry, University College, Dublin) and revised by J. E. Gowan (1851 Exhibition Research Student). These have now been published as a booklet, "Name Index of Organic Reactions," by the Society of Chemical Industry (price 5s. net) in the hope that they may be useful to others. The aim is merely to give an idea of the nature of each reaction, and one or more references which will supply further information.

* * *

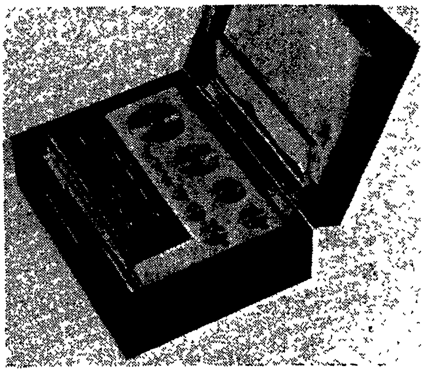
INCREASING application of the spectrograph in both academic and industrial research and in production control has brought about an increasing demand for standardised substances. Full details of the metals and compounds representing 68 elements and the forms in which they are available are given in "Standardised Substances for Spectrography, Chemical Analysis and Research," issued by Johnson, Matthey & Co., Ltd. The booklet, which is a revised edition of the company's publication No. 1760, is a complete reference for users of standardised substances.

* * *

A CONCISE but comprehensive survey of the post-war record of the steel industry is given in "The Monthly Statistical Bulletin" for March, 1950, (Vol. 25, No. 3) now available from the British Iron and Steel Federation.

* * *

A TEAM of technicians and directors from 18 firms is being organised by the Engineering Centre, Glasgow, to represent Scottish industry at the forthcoming Canadian Trade Fair, Toronto. This and other items concerning the activity of the centre are given in its quarterly bulletin No. 8, (April, 1950) now available.



[Courtesy of L. Oertling, Ltd.

Nickel-chromium weights are claimed to be more durable than other metals; they are non-magnetic and corrosion resistant to both oxidising and sulphur fumes. These are fitted with screw-type knobs to permit adjustment. Each set is contained in a polished mahogany case lined with white velvet. Brass-tipped forceps are included

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EXPLORING the Infinitesimal is the title of an article on the electron microscope, illustrated by photographs showing objects magnified 24,000 times, in the May issue of "The Shell Magazine." There is a full report of the launching by Princess Margaret of the S.T.S. *Velutina* at Wallsend-on-Tyne and an article on the development of the Shell tanker fleet.

* * *

APPLICATION of Inconel to diesel engine exhaust systems on lifeboats and its properties at elevated temperatures are described in the current issue of "Wiggin Nickel Alloys," published by Henry Wiggin & Co., Ltd. Birmingham. Other articles include Nickel in Water Meters, Monel Steam Accessories and Oil Filters, and A Corrosion-resistant Type of Thermometal.

* * *

MORE than 60 reports have recently been published by Research Information Service (509 Fifth Avenue, New York 17) on German research and manufacturing processes in the field of synthetic resins and resin intermediates. Research Bulletin No. 44, "Plastics," lists research data contributed by the Scientific Intermediates Commission of I. G. Farbenindustrie, patent applications, etc.

The Chemist's Bookshelf

PRACTICAL ORGANIC CHEMISTRY. J. J. Sudborough and T. Campbell James. 2nd Ed. London, 1949. Blackie, pp. 450. 15s.

The first edition of this well known book appeared in 1909 and it has since then been reprinted many times. The opportunity has now been taken to revise the whole work completely and to incorporate many new experiments designed to give practice in some of the more modern synthetic methods. The characteristic layout of the book has been preserved, thus keeping together all the reactions and preparations related to one type of functional group. A useful feature is a number of selected experiments to illustrate various types of organic reactions, such as reduction and oxidation. In addition, much useful information is included on the preparation of reagents. The analytical aspect of a course in practical organic chemistry is not overlooked, since there are directions for the characterisation of unknown compounds, ultimate analysis and a most useful selection of experiments illustrating the quantitative estimation of common types of compounds. The high standard of the previous edition is well maintained and the present volume will prove entirely suitable for any student undertaking a degree course in chemistry. —G.D.

ATOMIC ENERGY. Edited by J. L. Crammer and Prof. R. E. Peierls. Penguin Books, Ltd., West Drayton, Middlesex, 1950. 1s. 6d.

Changes representing the swing of interest from the atomic bomb to the peaceful and industrial applications of nuclear physics are described in this work, which was originally intended only to be a reissue of "Science News 2," long out of print. The opportunity has, however, been taken not only to revise the original material but to add four new articles and many fresh illustrations.

British and American experts have combined to contribute a comprehensive survey which can be appreciated by the layman as well as a useful introduction to anyone concerned in the application of atomic energy to industry, civil defence or public health.

The nine sections are devoted to the release of atomic energy and production of atomic fuel by isotope separation, by Prof. Peierls; atoms and nuclei, by H. A. Bethe; nuclear reactors, by Sir John Cockroft; raw materials for atomic power, by C. E. Tilley; physics of the bomb, by Philip Morrison; use of radioactive isotopes in biology and industry, by W. J. Arroll and K. Fearnside; a note on health hazards, by J. L. Crammer; and the tools of nuclear physics, by O. R. Frisch.

The 24 plates show part of the plants of four of the five countries now engaged in atomic energy development—none being available from the U.S.S.R. There are also some interesting notes about the contributors and a useful index.

ZUR KENNTNIS DER KONTAKT-INSEKTIZIDE. Dr. R. Riemschneider. 1949. Werner Saenger, Berlin. Pp. 150. Dm.10.

The author continues and summarises his work on contact insecticides begun in a special number of *Die Pharmazie* (THE CHEMICAL AGE 59, 182), starting with a survey of the technology and the chemical, physical and toxicological properties of the halogen-hydrocarbons. A concise review of international research and developments is presented, based on published material, and on reports by those who are actually testing their suitability as insecticides and for biological purposes. The bibliographical list of the publication covers 11 pages with 340 references, apart from those quoted in footnotes.

The text is divided into two, the first part dealing with the DDT- and DDD-groups, and the second with the HCH-group. Each section covers formulæ, properties and applications comprising 50 tables and illustrated by 20 figures.

The author's work and considerable experience enable him to give a critical and comprehensive survey of insecticides and make this book a short encyclopædia. Much tribute is paid to British literature, patents and products, and special attention given to gammexanes and the many varieties of the DDT-groups.

◆ HOME ◆

Oils and Fats

No change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the 4-week period ending June 3, 1950.

Antibiotics Price Reduced

The second price reduction of streptomycin, since it became available on prescription, is announced by Glaxo Laboratories, Ltd. The price of dihydrostreptomycin is reduced by the same amount.

Zinc Prices Raised Again

An immediate increase of £4 a ton in the price of good ordinary brand zinc was announced by the Ministry of Supply on May 9. The price was raised from £99 10s. to £103 10s. a ton delivered; other grades increased accordingly. Prices of zinc oxides in lots of not less than two tons delivered were increased by £3 10s. a ton.

Gas Engineers' New Quarters

The Institution of Gas Engineers has moved into new headquarters at 17, Grosvenor Crescent, London, S.W.1, which were opened yesterday by Mr. A. Robens, Parliamentary Secretary to the Ministry of Fuel and Power, in the absence of Mr. Noel-Baker. Mr. C. H. Chester, president of the institution, presided at the ceremony.

April's Record Steel Output

Steel production in April was at an annual rate of 16,822,000 tons, compared with 15,854,000 tons in April, 1949, both months being affected by the Easter holiday. This represents the highest rate of production ever achieved in that month, reports the British Iron and Steel Federation. Pig iron output was at the annual rate of 9,492,000 tons, compared with 9,288,000 tons a year ago.

Coal Distillation Proposal Revived

Miners in Scotland are again raising the proposal for the erection of a coal distillation industry in Lanarkshire and attempted at the Scottish Trades Union Congress, to obtain backing for their persistence. It is urged that some 9 million tons of coal could be worked if a distillation unit were created. The Scottish Council (Development and Industry) which recently decided that the project was not economic, has agreed to continue consideration of the matter. It is still considered unlikely that any scheme of distillation will be officially sponsored in Lanarkshire.

Pharmaceutical Examinations

Forty men and six women qualified as chemists and druggists at the April examinations of the Pharmaceutical Society. Forty-six men and 29 women passed the intermediate examination.

Coal Production Lower

Output of coal last week was 4,211,500 tons, compared with 4,396,000 tons the previous week. Production of deep-mined coal fell from 4,121,400 tons of the previous week to 3,927,000 tons, but opencast output increased from 274,600 tons to 284,500 tons.

Export Credits

The Export Credits Guarantee Department announces the removal, as from May 4, of its West London and Western district office from Mayfair Court, Stratton Street, W., to Victory House, 99/101 Regent Street, W.1. Tel: Regent 0682/3/4. Telegraph: Credexport Piccy.

New Dunlop Factory

A new factory to make latex foam cushioning is about to be opened by the Dunlop Rubber Company on the Hirwaun Trading Estate in South Wales. A group of buildings, acquired by arrangement with the Board of Trade, gives a floor area of more than 250,000 sq. ft. Plant will be installed immediately, and when the factory is in full production it will employ 900.

New Veterinary Streptomycin

Glaxo Laboratories, Ltd., Greenford, introduced last week a new streptomycin treatment for some forms of bovine mastitis which are resistant to penicillin. This, dihydrostreptomycin veterinary cerate, is regarded as complementary to penicillin and not as a replacement. It is likely to be most useful against organisms which are penicillin-resistant and penicillinase-producing; strains of *E. coli* and *Staph. aureus* are examples of such bacteria.

New Leather Research Laboratories

The Duchess of Kent has consented to perform the opening ceremony of the new laboratories of the British Leather Manufacturers' Research Association at Milton Park, Egham, Surrey, on May 22. On the afternoon of the following days (May 23 to 25) the laboratories will be open for inspection by members and their representatives. There will be an exhibition of the work of the Research Association, and a display of the wide variety of products of the industry. The director of research is Dr. Henry Phillips.

◆ OVERSEAS ◆

German Lead for U.S.A.

The intention of the U.S.A. to purchase with counterpart funds 5000 tons of premier grade lead from Germany was announced last week by the U.S. High Commissioner in Frankfurt.

Argentine Sulphur in Government Hands

The Direccion General de Fabricaciones Militares, Argentina, has been authorised to acquire the privately-owned shares in Industrias Quimicas Nacionales company, formed to manufacture sulphur and its by-products.

Industrial Development in Spain

The Ministry of Industry has announced particulars of its 1950-51 industrialisation plan aimed at the development of the mineral, steel and chemical industries. Plans include extensive prospecting for coal and metals, installation of rolling mills and increasing the output of chemical products and cement.

Increased German Coal By-Products

The increase in the output of coal in Western Germany from 87 million tons in 1948 to 103 million tons last year has brought a corresponding increase in the output of coal by-products. The 1949 figures for the most important of these (in thousand tons) are: Crude benzol, 239 (202 in 1948); crude tar, 839 (716); sulphate of ammonia, 278 (230).

Indian Fuel Research

Dr. Raejendra Prasad, President of India, opened the National Fuel Research Institute at Dingwadit, in the Jharia coal fields, Bihar, on April 22. It is hoped to produce 70,000 tons of aviation petrol a year, which would be amply sufficient for India's needs. Reserves of Indian coal have been estimated at 65,000 million tons, of which 22,000 million tons are now considered to be workable. Of that, good quality coal does not exceed 5000 million tons.

Dutch-U.S. Plastics Agreement

The Dutch Wire & Cable Co. ("Draka") has concluded a contract with the (U.S.) Dow Chemical Company by which the Dutch company receives a licence for the application of the primary material to produce the cellular resin, Saran. Increasing use is being made by the Dutch company of polyvinyl chloride and polyethylene for producing pipe and hose materials, etc.

Austrian Lithopone

Work at the new lithopone factory of the Bleiburger Mining Union is due to begin soon. The works will have a capacity of 4200 tons annually, twice that of the old installation.

Japanese Chemicals for Argentina

According to reports from Tokyo, Argentina has granted facilities to import Japanese goods to the value of U.S. $8.8 million, including chemicals valued at $500,000, and iron and steel worth $140,000. These facilities are in addition to import permits already issued, valued at U.S. $3 million.

U.S. Aluminium Production Improves

Output of primary aluminium in the U.S.A. in January showed a return to a more normal level. The total of 52,028 short tons was only 1333 short tons less than the same month of 1949, and a 26 per cent improvement over the December figures. Prices of primary pig and ingot remained unchanged.

New Belgian Oil Refinery

Work has now begun on the 30,000 barrel-a-day oil refinery being constructed at Antwerp by the Kellogg International Corporation (European subsidiary of the M. W. Kellogg Co., New Jersey, U.S.A.) for the Société Industrielle Belge de Pétroles. The refinery is near the Scheldt river. Completion of the refinery is scheduled for the middle of 1951.

U.S. Aluminium Plant for Austria

Four U.S. cold rolling units are being erected at the aluminium works in Ranshofen, Austria. They were purchased with ERP funds and a loan from the Export-Import Bank in Washington. The works plans to produce annually 10,000 metric tons of strips, pipes, bars, profiles, wires, etc. The number employed, now 100, is to be increased to 425.

Indian Standards for Heavy Chemicals

To meet the needs of the textile, paper and other industries in India, the chemical division of the Indian Standards Institution has drawn up draft standard specifications for the following heavy chemicals: sodium sulphate, technical; Glauber's salt, technical; Epsom salts, technical; potash alum, technical; ammonia alum, technical; aluminium sulphate, non-ferric; alumino ferric; alum cake; copper sulphate, technical; and iron sulphate, technical.

• PERSONAL •

Prof. M. H. L. Pryce, Wykeham Professor of Physics, Oxford University, who is consultant to the Atomic Energy Research Establishment, Harwell, has agreed to be responsible for the technical supervision of the theoretical physics division at Harwell for the time being. This position was formerly held by Emil Fuchs. Prof. Pryce, who is 37 years of age, is an expert on the industrial application of atomic energy.

Sir John Anderson was to perform the opening ceremony, yesterday (May 12), at the new research station at Gomersal, near Leeds, of the Coal Tar Research Association.

Chemical Commodities, Ltd., formerly the Czechoslovak Chemical Works (London), Ltd., announces the resignation of the following directors: Mr. David Finnie, Dr. George Lewi and Capt. C. F. Ward Jones.

Joseph Harrison Brennan, chief metallurgist of the Union Carbide & Carbon Corporation, was the 20th recipient of the Jacob F. Schoelkopf Medal for 1950, bestowed annually by the American Chemical Society for outstanding chemical achievement. The award was "in recognition of his contributions to the metallurgical practices of the ferro-alloy industry, particularly with respect to the economical production of ferro-chromium of very low carbon content, and the development of processes for winning tungsten and other less common metals from their ores."

Edgar Allen & Co., Ltd., announces the appointment of Mr. William E. Goodrich as an assistant to Dr. Edwin Gregory in the company's research laboratory. Mr. Goodrich is a Master of Metallurgy and Brunton Research Metallurgist of Sheffield University. From 1921-1925 he was senior metallurgical investigator for the British Non-Ferrous Metals Research Association. Before joining Edgar Allen & Co., Ltd., in December 1949, he was superintendent of metallurgical research and development for the Guest, Keen and Nettlefolds Group.

The election is announced of Mr. George C. Sharp as a director of the International Nickel Co. of Canada, Ltd. He is a member of the law firm of Sullivan & Cromwell, the company's general counsel, and has been actively engaged on the company's legal affairs for more than 25 years. He fills the vacancy on the board of Mr. John Foster Dulles, who resigned following his recent appointment by President Truman as special adviser to Secretary of State, Dean Acheson. He is also a director of the company's U.S. subsidiary, The International Nickel Company, Inc.

Among the personalities to be honoured by the University of Liverpool with the conferment of honorary degrees in July is Professor Hugh Stott Taylor,; Professor of Chemistry at the University of Princetown, New Jersey, U.S.A., who was born at St. Helens in 1890. Professor Taylor, now one of America's leading research directors. won the David Gamble scholarship at Liverpool University in 1906 and in 1909 he gained his B.Sc., first-class (honours chemistry) and the Sheridan Muspratt Scholarship for post-graduate work.

The following passes in the final examination for degree of B.Sc. in applied chemistry at Glasgow University have been announced:—

Dyestuffs and their applications—Farquharson, E.N.; Hair, G. H.; Jamieson, I. M.; Johnston, J. M.; M'Lintook, G. K.; M'Naughton, D.; Martin, P.; Pajaczkowski, A.; Rose, T. J.; Sneddon. J. G.; Taylor, D. B.

Fuels (Advanced)—Bennett, R. N.; Deans, A. A.; Hall, F.; Harris, J. G. H.; Hoy, G.; Robertson, S.; Roxburgh, D.; Sneddon, L. M.; Taylor, A. W.; Ward, R. M.

In appreciation of his 30 years' service as chemist to John W. Leitch & Co., Ltd., aniline dye manufacturers, Huddersfield, Mr. Harold Greaves was presented with an oak grandmother clock by the managing director, Dr. A. E. Everest.

THE 47th festival dinner of the Readers' Pensions Committee will be held at the Connaught Rooms, London, on May 18 at 7 p.m. Mr. E. Glanvill Benn, who has been appointed chairman of the committee for 1950 and will preside at the dinner, recalls that its work began 62 years ago on the principle of self-help. He emphasises the reliance of publishers—and of all who read books, newspapers, periodicals, etc.—on the accuracy of the printer's reader and asks for the public's generous support.

Donations to the fund should be addressed to the hon. secretaries, 1 Gough Square, E.C.4.

THE COSTLY NINEPENCE

Effects of Rising Transport Costs

THE Government has struck a spiteful blow at the whole economic existence of Britain, observed the British Road Federation in a recent comment on the Budget proposals. The tax on motor fuel and the 33⅓ per cent purchase tax on commercial vehicles, said the Federation, are aimed at penalising indispensable road transport. Ninepence a gallon—an increase of 33⅓ per cent on present prices—will damage every family budget in the country. From now on the price of all classes of goods will start rising, while bus and coach fares will follow suit. Lower income classes will be among the worst affected. Not a single factory worker, not one housewife can hope to escape. Every lorry load of export goods will cost more at a time when buyers' markets are already creating desperate international competition.

Mr. F. D. Fitz-Gerald, national secretary of the Traders' Road Transport Association, national organisation for "C" licence-holders, said the new imposts appeared to be an effort to force the transfer of traffic from roads to rail. That this transfer would automatically take place was not a sound assumption. Traders and industrialists, when determining the most suitable form of transport, by no means based their decision solely on relative freight charges. There were other and equally important factors, such as speed of delivery and reduction of handling and packing costs.

FERTILISER PRICES RAISED

First Result of New Rail Rates

THE Board of Trade has made an order, effective on May 15, which provides increased maximum prices for all fertilisers in Great Britain other than muriate and sulphate of potash, but including compound fertilisers.

The increase in price will be 2s. 6d. per ton for superphosphates, ground phosphates and compound fertilisers; 3s. per ton for basic slag; and 4s. per ton for sulphate of ammonia. These increases are to cover higher delivery costs due to the increase in rail freights.

"The London Boy"

MORE than two hundred guests are expected at the annual dinner of The John Benn Boys' Hostels Association at the Connaught Rooms on May 17, at which Lord Derby will preside. The toast of "The London Boy" will be proposed, as in former years, by a public school headmaster, on this occasion by Mr. George Turner, C.M.G., Headmaster of Charterhouse. Other speakers, besides Lord Derby, will include Lord Justice Denning, Lord Webb-Johnson and Sir Ernest Benn. Tickets for the dinner are still obtainable from the Appeal Secretary, Miss Lury Bouverie House, Fleet Street, E.C.4.

OBITUARY

THE death was reported last week of **Dr. Gilbert Wooding Robinson**, professor of agricultural chemistry and adviser in the school of agriculture in the University College of North Wales at Bangor. The doctor was widely known as an authority on the properties of soils and had particularly close associations with Spain, from which country he had, in fact, returned only a fortnight before his death. Early this year he had welcomed a number of Spanish scientists at Bangor and in 1946 he delivered a series of lectures at Madrid University. In 1949 Dr. Robinson went to New Zealand as delegate of the Royal Society at the Pacific Science Congress. He had travelled widely and was an excellent linguist. When he presided at an international conference of soil experts at Bangor before the war he used six languages. cast and was author of a number of works on soils. During the war he was Director of Soils Surveys in England and Wales.

Dr. Hugo Alexander Dickie, one of the leading metallurgists in Great Britain, died in a Northampton hospital last week. The doctor, who was 54, was general manager of research and technical development at Stewart and Lloyds, Corby. He served on a number of committees of the British Iron and Steel Federation, and was a member of the British Iron and Steel Research Association.

The death occurred recently of **Mr. Gavin Lawson**, chief chemist and a director of Cumming, Parson, Ltd., essence distillers, Manchester. Mr. Lawson, who was 40, went to the company's head office in Manchester in 1936. He took an active part in building up a wide range of flavourings.

The Stock and Chemical Markets

STOCK markets have been uncertain in the absence of improved demand. Even British Funds eased earlier in the week, despite over-subscription of the £150 million British Electricity issue. Higher rail freights and the increased petrol tax caused uncertainty in industrial shares; these further rises in costs mean that it will be increasingly difficult to maintain profits or prices.

Imperial Chemical failed to hold an earlier improvement, easing again to 42s., pending publication of the full results and the chairman's annual statement. They are awaited with particular interest in the City. Monsanto were 47s., Albright & Wilson 28s. 3d., Brotherton 10s. shares 19s. 3d., Boake Roberts 26s., Laporte Chemicals 5s. shares 9s. 6d. and Amber Chemical 2s. shares 4s. 9d. In other directions, F. W. Berk 2s. 6d. shares were 14s. 3d., Bowman Chemical 4s. shares 5s. 3d. and L. B. Holliday 4½ per cent preference 19s. 9d. Fisons were 22s. 6d. and Turner & Newall rose further to 80s. 7½d.

In the plastics and kindred sections, British Xylonite rose further to 73s. 9d., De La Rue were 20s., British Industrial Plastics 2s. shares 5s. 4½d., and Kleemann 1s. shares 7s. 4½d. ; The 4s. units of the Distillers Co. firmed up to 17s. 7½d. and Associated Cement remained active around 80s. 6d.

Paint shares strengthened again, notably Goodlass Wall to 34s. 3d. and Pinchin Johnson were 40s. British Oxygen were dull at 88s. 1½d., prior to the annual meeting, and British Glues & Chemicals eased to 19s. 9d. Borax Consolidated, however, remained steady at 51s. 6d. Dunlop Rubber changed hands around 62s., prior to the dividend announcement, and in other directions, Lever & Unilever have been steadier at 40s. 4½d.

Iron and steels strengthened as a result of the good impression created by financial results issued recently. Guest Keen were 44s. 6d. on the Jubilee bonus, Stewarts & Lloyds remained under the influence of the increased profits, and the yield of 6¼ per cent drew attention to United Steel at 25s. 6d. Dorman Long were 30s. 3d. and Staveley changed hands around 78s. 6d.

Babcock & Wilcox, however, eased to 60s. after the chairman's warning on the weight of taxation and growing competition. Newton Chambers rose to 75s. 6d. at Sheffield on further consideration of the past year's figures, which showed the unchanged 15 per cent dividend to be substantially below earnings on the shares. The market expects that when compensation for colliery interests is eventually received there will be a special return of some kind for shareholders.

Boots Drug have been steady at 46s. 9d., reflecting general confidence that the 40 per cent dividend on these 5s. shares is likely to be maintained despite the increased capital. Sangers were 21s. 6d. and Beechams deferred 12s. 6d. Glaxo Laboratories 10s. shares have been active around 46s. 6d.; British Drug 5s. shares were 6s. 6d. and Evans Medical 6s. 4½d.

Market Reports

GOOD delivery specifications for heavy chemicals have been reported and an active demand is in evidence from most of the large consuming industries. Prices are for the most part unchanged, although the undertone is distinctly firmer, due to the expectation of higher transport costs. The convention rates for red and white lead have again been advanced as a result of the higher price for the metal, the new basis price for dry white lead being £118 5s. per ton and for dry red lead £108 15s. per ton. The overall improvement in the supply position continues to be maintained and there is now little difficulty in meeting most of the demands from overseas markets, which, however, are becoming increasingly competitive. The feature in the coal tar products market continues to be the advance in prices due to the petrol tax. The market has enjoyed a more active demand than for some time.

MANCHESTER.—Reasonably brisk trading conditions have been reported during the week in most sections of the Manchester chemical market. The textile and other principal using industries continue to take good deliveries against contracts. Replacement buying of the soda, ammonia and magnesia compounds, as well as in a good many other lines, has been fairly substantial in the aggregate. A steady movement of supplies on export account has also been reported. Prices are generally firm, with further advances recorded for the lead and zinc compounds.

GLASGOW.—There has been little change in the Scottish chemical market this week, apart from some heavy buying in an endeavour to build up stocks before the increase in freight rates. Considerable uncertainty exists about future prices. Demand for coal tar products has been well maintained.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Hydrol Cement Waterproofers, Ltd: (formerly Miners Cement Waterproofers, Ltd.), London, S.W. (M., 13/5/50.) April 12, £2500 and £1500 mortgages, respectively to Moller Investment Trust, Ltd., and British United Investment Corporation, Ltd.; both charged on 147 Bollo Bridge Road, Acton. *Nil. January 13, 1947.

Industrial Chemicals, Ltd., London, W.C. (M., 13/5/50.) April 11, series of £5000 debentures, present issue £1500; general charge. *Nil. July 22, 1949.

F. H. Steele & Co., Ltd., Dublin, manufacturing chemists. (M., 13/5/50.) April 4, mortgage for securing £1800 and any other moneys that may become due to the Irish Civil Service (Permanent) Building Society charged on 6 Dundela Avenue, Glenageary, Co. Dublin. *Nil. March 17, 1949.

Company News

British Aluminium Co., Ltd.

Profit of the British Aluminium Co., Ltd., for the year, amounted to £1,463,218. General reserve increased to £2,750,000 by an allocation of £125,000. Final dividend of 6 per cent recommended on Ordinary stock, making a total of 10 per cent.

Guest, Keen and Nettlefolds

A final ordinary dividend of 7 per cent, to make 11 per cent, less tax, for 1949, is announced by the board of Guest, Keen and Nettlefolds (6 per cent final in 1948). A bonus of 1½ per cent, less tax, on the ordinary stock is proposed to mark the 50th annual meeting on June 22. The 1949 group profit, net, was £2,888,098 (£2,918,682).

John Summers & Sons, Ltd.

The group profit, before tax, of John Summers & Sons, Ltd., for 1949 was £2,924,000 (£2,476,000 in 1948). The ordinary dividend of 8½ per cent is maintained. The chairman, Mr. R. F. Summers, said that the company's development scheme would cost £14-15 million and would be completed in about three years.

New Registrations

Alfred P. Cumming, Ltd.

Private company. (27,656). Capital £10,000. To acquire the business of chemical manufacturers carried on by J. R. Thomson & Co., Ltd., of 10 Blythswood Street, Glasgow, as "The Alpha Chemical Co." (but no other part of the business carried on by the said company). Director: E. R. Cumming. Reg. office: Woodside House, Blairmore, Argyllshire.

Evers & Wall, Ltd.

Private company. (481,511). Capital £100. Manufacturers of chemicals and insecticides, used for agriculture and for the preparation and preservation of foodstuffs; fertilisers, etc. Directors: C. E. St. John Evers, E. Wall. Reg. office: West Street, Aldbourne, nr. Marlborough, Wilts.

Ecam, Ltd.

Private company. (481,733). Capital £10,000. To acquire the business of a manufacturer of scientific glassware and apparatus, etc., heretofore carried on by Edward J. Camp at 227 and 229 St. George's Way, S.E.15, as Camp Industries. Directors: E. J. Camp, F. D. Edwards and A. S. D. Barrett. Reg. office: 227/228 St. George's Way, S.E.15.

Increases of Capital

The following increases in capital have been announced: Ibco Products, Ltd., from £100 to £5000; Redfearn Bros., Ltd., from £150,000 to £325,000; Hilgan Products, Ltd., from £2000 to £3500.

Changes of Name

The following changes of name have been announced: Crosfield, Watson & George, Ltd., becomes Crosfield (CWG), Ltd.; Phantosol Products, Ltd., becomes Aerosol Products, Ltd.; D. & W. Gibbs (U.K.), Ltd., becomes Price's Soap Co., Ltd.; Price's Soap Co., Ltd., becomes D. & W. Gibbs (U.K.), Ltd.

"Klingerit" Jointings

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Universally applicable for all pressures and temperatures

SUITABLE FOR:

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- Compressed air and gases
- Oils and other hydro-carbon fluids
- Solvents, refrigerants
- Chemicals, alkalis and most acids

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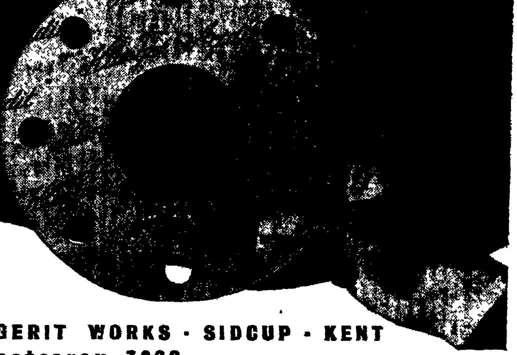

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OPEN DAYS AT CRL

IN order to disseminate as widely as possible information regarding the research work carried out at the Chemical Research Laboratory, DSIR, Teddington, Middlesex, a number of "open days" have again been arranged this year.

There will be four sessions: in the afternoons of Wednesday and Thursday, June 28 and 29, and on Friday, June 30, morning and afternoon.

These will provide opportunities for industry, other Government departments, universities and other research workers to visit the Laboratory and gain knowledge of the main branches of research, which are devoted to corrosion of metals; inorganic chemistry; radiochemistry; organic chemistry; high polymers and plastics; and microbiology.

The afternoon of June 28 has been set aside for representatives of industrial firms which have not previously received invitations, and the director would be pleased to receive applications up to June 19.

Irish Institute of Chemistry

AT the first annual general meeting of the Institiuid Ceimice na hEireann (the Institute of Chemistry of Ireland) attention was drawn to the fact that there was comparatively little representation of chemists on some of the principal organisations in Ireland.

The meeting stressed the contribution which the chemist can make to efficiency in industrial production, and it was noted with regret that this fact was apparently not appreciated by the Government. No chemist was appointed to either the Industrial Development Council or the Council of Education.

The meeting elected the following officers: President: Dr. A. G. G. Leonard; vice-president: Mr. W. V. Griffiths; hon. secretary: Mr. F. T. Riley; hon. treasurer: Mr. M. Cranley. Council members: Dr. V. Barry, Mr. D. Crowley, Prof. T. Dillon, Mr. D. T. Flood, Mr. G. F. O'Sullivan, Prof. T. S. Wheeler. Secretary: Mr. G. Martin Wheeler.

Industrial Electronics

A series of four lectures on industrial electronics is to be given by scientists of the Mullard Electronic Research Laboratories at The Engineering Centre, 351, Sauchiehall Street, Glasgow, C.2. The first, "Ultrasonics," by Dr. B. E. Noltingk, was delivered on May 11.

(continued at foot of next column)

The other lectures, which will be at 7.30 p.m., are: (June 8) "Some Industrial Measuring Instruments," by Dr. H. A. Dell; (September 14) "Photoelectric Devices," by J. A. Jenkins; (October 12) "Vibration Test Methods and Measurements," by Drs. Dell and Noltingk.

NEXT WEEK'S EVENTS

MONDAY, MAY 15

The Chemical Society

Oxford: Physical chemistry laboratory, 8.15 p.m. Alembic Club Lecture. Prof. A. R. Peters: "The Biochemistry of Fluoroacetate Poisoning and its Significance."

Electrodepositors' Technical Society

London: Northampton Polytechnic, St. John Street, Clerkenwell, E.C.1, 6 p.m. W. F. Overthrow: "Gilding."

WEDNESDAY, MAY 17

Oil and Colour Chemists' Association

London: Manson House, 26 Portland Place, W.1, 7 p.m. N. H. E. Ahlers (Paint Research Station): "Absorption Spectroscopy in Paint Research."

Incorporated Plant Engineers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7 p.m. R. S. Wilkins: "Applications of the Specialised Plant to Gas Turbine Research."

Society for Visiting Scientists

London: 5 Old Burlington Street, W.1., 7.30 p.m. Discussion meeting: "The Use of Radioactive Isotopes in Industry and Research." Chairman: Sir John Cockroft; speakers: W. J. Arrol, K. Fearnside and W. G. Marley.

THURSDAY, MAY 18

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. F. Kidd (director, the Food Investigation Board): "Food Research Under the Department of Scientific and Industrial Research."

Incorporated Plant Engineers

Nottingham: Albert Hall Institute. Annual conference (3 days).

FRIDAY. MAY 19

The Royal Institution

London: 21 Albemarle Street, W.1, 9 p.m. F. P. Bowden: "Friction."

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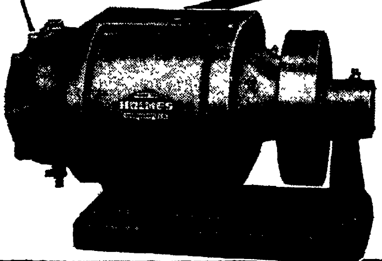

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process of preparing penicillamine and its derivatives.—Merck & Co., Inc. March 13 1947. 638,513.

Aliphatic olefins and manufacture thereof. — California Research Corporation. April 16 1947. 638,514.

Polymerisable esters and polymers thereof.—N.V. De Bataafsche Petroleum Maatschappij. June 8 1947. 638,516.

Electrodeposition of metals or alloys.—Udylite Corporation. June 24 1947. 638,307.

Methods of preparing oxazolone derivatives and substituted acrylic acids.—Merck & Co., Inc. July 8 1947. 638,520.

Flame-resistant finish for fibrous cellulosic materials.—American Cyanamid Co. July 14 1947. 638,434.

Treatment of aluminium oxide coatings. —A. H. Stevens (Aluminium Co. of America). July 14, 1947. 638,374.

Production of alloys of an alkali metal and lead.—A. A. Johnson (trading as A. Johnson & Co.). July 18, 1947. 638,435.

Methods of preparing organopolysiloxanes.—British Thomson-Houston Co., Ltd. August 27, 1947. 638,313.

Composition of matter.—Durastic, Ltd., and C. A. Redfarn. September 7, 1948. 638,314.

Production of organic esters of cellulose. —British Celanese, Ltd. Sept. 12, 1947. 638,316.

Liquid polysiloxane oils.—British Thomson-Houston Co., Ltd. Sept. 23, 1947. 638,317.

Process for the electrolytic polishing and oxidation of aluminium articles.—Soc. Anon. Pour La Protection et la Coloration des Metaux, Trefileries et Laminoirs du Havre, and J. F. G. Oct. 27, 1947. 638,321.

Electrostatic precipitators.—Westinghouse Electric International Co. Nov. 14 1947. 638,227.

Compounds of metacresol and 2 : 6—lutidine.—Reilly Tar & Chemical Corporation. Nov. 19, 1947. 638,532.

Compounds of paracresol and pyridine bases.—Reilly Tar & Chemical Corporation. Nov. 19, 1947. 638,533.

Manufacture of condensation products of sulphanilamidothiodiazoles.—Ciba Ltd. Dec. 4, 1947. 638,534.

Moulding powders comprising fluorine-containing polymers.—E. I. du Pont de Nemours & Co. Dec. 8, 1947. 638,328.

Preparation of stable penicillin-containing solutions.—E. B. Chain, and F. J. Philpot. Nov. 24, 1948. 638,535.

Production of sterols and their addition products from material containing sterols. —Naamlooze Vennootschap Veenendaalsche Sajet-en Vijfschachtfabriek, Voorheen Wed. D. S. Van Schuppen & Zoon. Dec. 30, 1947. 638,393.

Solutions of polyacrylonitrile.—Imperial Chemical Industries, Ltd., R. Hill, R. G. A. New, and S. M. Todd. Jan. 14, 1949. 638,331.

Purification of vitamin B6.—Merck & Co.. Inc. Jan. 28, 1948. 638,397.

Antifoaming compositions.—Chemical Industries, Ltd., and S. Stevens. April 6, 1949. 638,403.

Steel refining process.—E. F. J. Warnant. May 6, 1948. 638,256.

Process for the production and application of active catalysts containing copper and magnesium oxide.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 26, 1948. 638,340.

Recovery of sulphuric acid.—Distillers Co., Ltd., J. Howlett, H. R. Archer, and W. A. Smart. June 21, 1949. 638,547.

Preparation of substituted pteridines.—American Cyanamid Co., and A. H. Stevens. April 24, 1946. 638,480.

Method for manufacturing a granular fertiliser containing ammonium nitrate and calcium carbonate.—H. W. K. Jennings (Directie Van De Staatsmijnen in Limburg). Feb. 26, 1941. 638,061.

Testing apparatus.—Firestone Tire & Rubber Co. Dec. 21, 1945. 638,134.

Production of compositions containing finely divided metallic silver.—Ward, Blenkinsop & Co., Ltd., H. G. Dickenson, K. T. Chapman and P. P. Hopf. Sept. 5, 1947. 638,149.

Process for the production of oxygen-containing organic compounds.—E. I. Du Pont de Nemours & Co., W. F. Gresham, and R. E. Brooks. Oct. 10, 1946. 637,999.

Valves for corrosive and other liquids.—J. Caporossi, and A. Caporossi. Nov. 8, 1946. 638,145.

Dry dusting preparations for combating pests.—Ciba Ltd. Nov. 22, 1946. 638,065.

Manufacture of thiophene derivatives.—Merck & Co., Inc. Dec. 10, 1946. 637,923.

Manufacture of tetrahydrothiophene derivatives.—Merck & Co., Inc. Dec. 10, 1946. 637,924.

Polyamide resins.—Wingfoot Corporation. Jan. 10, 1947. 637,926.

Bleaching process using hydrogen peroxide as bleaching agent.—Solo Zavody Na Zapalky, Narodni Podnik. Jan. 24, 1947. 637,928.

Solenoids.—A. A. Thornton. (Magnavox Co.). Jan. 29, 1947. 638,005.

Alloys.—Westinghouse Electric International Co. Feb. 20, 1947. 638,007.

Production of reversible alginate gels.—Alginate Industries, Ltd., E. G. Millatt, and E. G. Muller. March 19, 1948. 637,864.

Apparatus for utilisation of intranuclear atomic energy.—N. S. Japolsky. April 6, 1948. 637,866.

Acetylene generating devices. — S. Wilman. March 8, 1947. 637,929.

Rubber compounding ingredients.—Anchor Chemical Co., Ltd., and K. C. Roberts. March 1, 1948. 638,071.

Liquid compositions including a styrene monomer and method of preventing polymerisation of a styrene monomer.—Monsanto Chemical Co. March 25, 1947. 637,868.

Process for increasing the sulphuric acid content of aqueous sulphuric acid.—Krebs & Co., Ltd. April 3, 1947. 637,930.

Polychloro tetrahydro - dicyclopentadiene.—Hercules Powder Co. April 9, 1947. 638,012.

Preparation silicic-acid esters.—Naamlooze Vennootschap Philips Gloeilampenfabrieken. April 17, 1947. 638,072.

Apparatus for the control of industrial chemical processes.—Marconi Instruments, Ltd., and W. B. Bartley. April 16, 1948. 638,073.

Supersonic inspection apparatus.—Sperry Products, Inc. May 20, 1947. 638,165.

Manufacture of catalysts.—Imperial Chemical Industries, Ltd. (African Explosives & Chemical Industries, Ltd.). July 9, 1948. 638,031.

Plasticised polymeric vinyl halide compositions.—B. F. Goodrich Co. July 17, 1947. 638,083.

Methods of securing together adhesively a portion of vinyl resin material and a second portion of material.—B. B. Chemical Co., Ltd. July 25, 1947. 638,085.

Catalytic synthesis of hydrocarbons.—Koppers Co., Inc. July 29, 1947. 638,087.

Lubricants.—Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. Aug. 5, 1947. 637,932.

Process for the production of diketones.—Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. Aug. 5, 1947. 638,091.

Fractionating towers.—Standard Oil Development Co. Aug. 5, 1947. 638,092.

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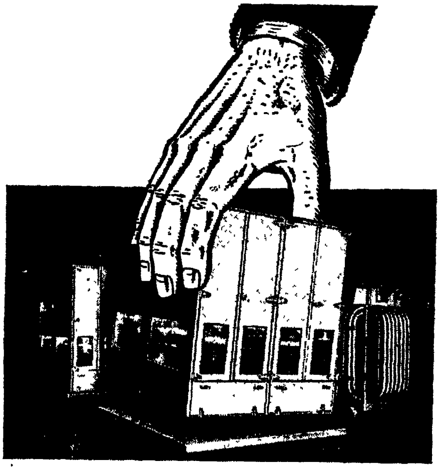

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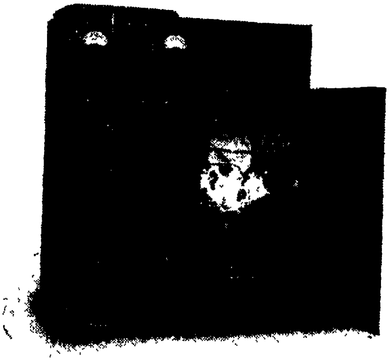

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Volume LXII 20 May 1950 Number 1610

Growing Export of Chemical Plant

ONE of the more significant changes in United Kingdom trade returns indicated by the "breakdown" of the net adverse balance on current account has been the conversion of a United Kingdom surplus of £100 million with the OEEC countries in 1948 into a deficit of £20 million last year. This very rapid decline seems to have been due in part to the policy of "liberalising" trade.

It is generally accepted that a reduction of the restrictions and high tariff barriers that have impeded the natural course of international trade is vital to world prosperity. The substantial progress in this direction made in recent months represents a welcome constructive contribution towards the restoration of economic stability. Liberalisation of trade, however, is liable to be regarded with understandable misgivings by industries which have been called upon to attain high export levels and given a considerable measure of protection in the home market by the import control system. In favourable conditions, competition is invigorating and, theoretically at any rate, any adverse consequences on the home market should be offset by the potential opportunities for developing markets formerly closed to British goods. In the light of experience, however, liberalisation of trade is being viewed by some manufacturers with a certain amount of apprehension. While the total effect should be favourable, the progressive reduction of import restrictions may well have unwelcome results in certain industries, especially when the backlog of orders has been cleared.

How does liberalisation of trade affect the outlook for such a rapidly expanding industry as the manufacture of chemical and petroleum plant? The progress of this key industry has been one of the outstanding features of Britain's economic recovery since the war and its future welfare is obviously a matter of prime importance. Because their products are vital to the economies of other countries, British exporters of chemical plant have seldom been excluded from overseas markets by the restrictions applied to commodities of a less essential nature. Liberalisation is thus unlikely to be of very much assistance to that form of export trade.

Chemical plant has been included in the United Kingdom Open General Licence list only since January 5, so that there has not yet been sufficient time for the effects of liberalisation on the home market to become apparent. There seems, so far, to be little evidence

On Other Pages

Leader:

Growing Export of Chemical Plant 737

Notes and Comments:

I.C.I.'s Export Trading . . 739
Systemic Insecticides . . 739
Peat as a Power Source . . 739
Iodine . . 740

Need of Oil Plant . . 741
Business at the BIF . . 741
U.S. Sponsored Research . . 741
Sulphuric Acid Totals . . 742
Canada's Record Production . . 742
Traders' Rôle in Chemical Industry 743
The Chemist in Industry . . 744
Industrial and Research Instruments 745
Dyestuffs Changes . . 746
Parliamentary Topics . . 746
April's Lower Exports . . 746
Engineering Advances at Birmingham 747
Vitreous Enamel Failure . . 750
Ironfounding Progress . . 750
U.S. Hydrazine Production . . 750
New Centre of Medical Research . . 750
Fuller Scope for Coal Tar Research 752
A Possible Rival of Pyrethrum . . 753
U.S. Addition to Plastics Sources . . 755
The Chemist's Bookshelf . . 756
Technical Publications . . 757
Accuracy of the Chemical Balance 758

OVERSEAS CHEMISTRY AND INDUSTRY

German Export Prospects . . 759
Increasing Mineral Yields in Egypt 760
South Africa's Material Sources . . 761

French Chemists Welcomed . . 762
Explosion Unexplained . . 762

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of increased competition from European sources, nor are there at present any disquieting elements in the changed position. Western Germany, being at present one of the hard currency countries, is still debarred from exporting to certain OEEC countries under open general licence, so that competition from this quarter is not likely to be unduly severe. Switzerland's is also a hard currency country, and Czechoslovakia cannot be regarded as a potential competitor so long as present conditions persist. Thus the only countries directly affected by trade liberalisation in this particular field are France and Belgium, whose production is not on a scale large enough to present any formidable challenge to British manufacturers at the present time.

Sooner or later, however, the return of Western Germany as a serious competitor will have to be faced. German manufacturers are losing no time in re-establishing their shattered industry and it is understood some 350 firms will be represented at the big exhibition of chemical plant which is to be held at Frankfurt in July. This exhibition should provide some indication of the progress being achieved. (THE CHEMICAL AGE, *62*, 718). The extent of Britain's pre-war dependence on imported chemical plant has been greatly exaggerated, since a large proportion of the country's requirements has always been locally supplied. A considerable amount of plant, however, used to be imported from Continental sources and especially from Germany.

Today the home industry is in a very much stronger position and it is being noted that almost every type of plant built on the Continent can be produced here, independently or under certain licensing arrangements. The strength of the industry is steadily increasing and, despite the very great home demand, many firms are exporting on a large-scale and still expanding their scope overseas. Exports are at present running at about the 1949 level and there seems to be little doubt that last year's very satisfactory figure will be reached again. The dimensions of that trade are not precisely defined in the Board of Trade summaries because of the considerable range of categories in which chemical plant participates.

(*continued on page 740*)

Notes and Comments

I.C.I.'s Export Trading

IN stimulating contrast with the sundry reports on economic affairs of the country as a whole is the annual report for 1949 of I.C.I., Ltd. The drawing of such a parallel is encouraged by the vast scope of the effort recalled by the industrial report, based as it is upon sales valued at £174.6 million (£10.6 million more than in 1948), and the fact that the overseas trade problems encountered were a faithful reflection of those in which national industries as a whole had to contend in 1949. The similarity of circumstances with somewhat similar reports by Government departments seems to end there. The I.C.I. report is in most respects a story of severe difficulties overcome or circumvented by flexible and rapid adaptation to new conditions. Greatly increased competition and some insurmountable barriers, notably to the Indian and Argentine markets, have characterised the export field, but I.C.I's direct exports remained at the same high level as in 1948 (58 per cent more than pre-war) and the total value, £38,384,000, was nearly £1 million larger than in the year before. The report does not evade the prospect that it will require the utmost exercise of adaptability, the power to innovate and possibly to reduce prices to preserve this high level of British chemical exports in the next 12 months. It is in these conditions that I.C.I's more or less intimate participation in foreign economies through subsidiaries and associates promises to secure the results which trade talks between Governments and international agreements so frequently fail to attain.

Systemic Insecticides

DURING the recent inauguration of the Crop Protection Panel, Agriculture Group, of the Society of Chemical Industry, at the Royal Institution, Dr. Hubert Martin, of Long Ashton Research Station, read an interesting paper on "Advances in Crop Protection." In the field of research related to the phosphorus fluorine compounds as systemic insecticides for crops, and of Parathion insecticidal compounds, an account was given of recent advances in changing molecular structure with the aim of making these poisons safe to use on food crops. He pointed out that toxicity had been reduced and that certain compounds were to some extent selective, so that a pest might be destroyed, while useful insects, such as the ladybird, may be unaffected. He expressed confidence that systemic compounds would ultimately be produced which would not be dangerous to man. Meanwhile, compounds were being marketed which were still dangerous unless the utmost care was taken to follow printed directions. Parathion smokes were dangerous, though it is considered by many that they are not more dangerous than the older practice of using cyanide. Of greater interest in the systemic field, was the possible manufacture and synthesis of hormone substances and antitoxins which could be used in the same way against fungoid diseases, rendering the plant immune and inhibiting the germination of spore. The nature of the toxins which fungi produce within plants is gradually being revealed, affording hope that means may be found of neutralising them by therapeutic treatment in a way that would be harmless to man.

Peat as a Power Source

CAUTION—to some it may appear as excessive caution—has characterised the programme to develop the great fuel, and possibly chemical, resources of the Scottish peat bogs. The high hopes raised shortly after the war and the impressive body of expert evidence that was mustered then seem to have met with a measure of frustration, hard to explain in the light of the manifest need to make use of all economical sources of energy. There are now belated evidences of a promising kind that intelligent use of one of the newer dynamic factors—the gas turbine—is to be made to make profitable use of Scotland's great natural asset. The Government White Paper on Scottish industry makes guarded reference to the possibilities of adapting to peat burning a 15,000 kW closed cycle gas turbine now being developed. It is thought, however, that the open cycle unit may serve the Scottish conditions better because it would deal satisfactorily with the high moisture content, which is likely to prove the chief limiting factor in any attempt to employ peat in more traditional combustion methods. In such a gas turbine the incidental generation of steam as well as gas in the carbonisation may indeed enhance the capacity of the plant. Gas turbine installations in the peat areas might go far to overcome one of the other principal impediments to economic peat utilisation—relatively costly transport —by consuming the fuel on or near the site. Harder to explain than the halting progress made in this sphere as a whole is the continued absence of any firm evidence that the North of Scotland Hydro-Electric Board, in whose territory most of the major peat areas lie, has any plans to co-operate in research and practical tests of peat as a source of electric power.

Iodine

THE immensity of the task of searching the relevant literature in the course of almost any chemical research is called to mind by the scope of one new work offered this week, which deals with only one aspect of one substance, iodine in its relation with plant life. This, it has to be borne in mind, as a subject is no more than a stripling when compared with some of the traditional materials of chemistry; the story had its beginning as recently as 1811 when Bernard Curtois identified iodine in seaweed ash. In 138 years there have been published more than 800 major studies of the bearing of iodine in plant life, which is, of course, only a small part of the story of iodine. The producers in London of "Iodine and Plant Life," the Chilean Iodine Educational Bureau, estimate that the world's literature can offer more than 30,000 papers concerned with iodine in biology and medicine, and they have courageously undertaken the task of collating and annotating in an orderly sequence the bibliography of the whole. The bureau does not pretend that even this impressively comprehensive looking volume, admirably cross indexed and sectionalised, is the last word on the subject. It is merely "all references the bureau has been able to discover relating to fundamental and applied knowledge of iodine and vegetable life—marine flora, land plants, bacteria and fungi." Complete or not, it is an addition of permanent value to chemical bibliography and a further token of the essential service rendered by devoted abstractors and special libraries.

GROWING EXPORT OF CHEMICAL PLANT

(*continued from page* 738)

A relevant fact, however, is the recorded increase in the value of gas and chemical machinery exports from £2.2 million in 1948 to £3.66 million last year. Equivalent sales in 1947 produced only £991,748.

There has been an appreciable improvement in the supply of labour and materials, and manufacturers exhibiting at the BIF at Castle Bromwich have generally been able to quote more realistic delivery dates. In this they have been assisted by a corresponding improvement in other industries, which has greatly reduced the delay resulting from shortage of such items as, for example, electric motors.

While it is impossible to forecast the ultimate consequences of liberating trade, there seems to be no cause for anxiety in regard to the immediate future. In view of the growing productive capacity of the industry and its widened export field even the ultimate re-emergence of powerful competition from Germany may not give much cause for alarm.

BUSINESS AT THE BIF

London Estimates of Results

STATEMENTS this week by representatives of the industry at the chemicals section at Olympia indicate that, although the volume of inquiry from overseas has been rather less this year, there has been a greater proportion of solid business interest. Laporte Chemicals, Ltd., for instance, believes that the majority of inquiries it received were of the kind from which profitable results can be expected.

Buyers, however, are more selective, demand early delivery dates and a firm price to enable them to obtain import licences. The same has been reported in the engineering sections at Birmingham.

In the opinion of another company, this year's BIF has been the best since the war. It was more than satisfied that the fair was of great value to chemical industry, which does not generally look for much immediate result in the form of direct orders negotiated during the fair. Nearly all exhibitors agree, however, that it is impossible yet to give any accurate appraisal of the business which may be attributable to the fair. It is common for several years to elapse before the full benefit of contacts made during two weeks in London is translated into tangible results. Chemical manufacturers deem highly important the establishment of friendly relations with their customers and co-workers abroad, and their policy at the BIF has again been guided by this principle.

The demand for plasticisers and solvents has, as expected, been high. One company expressed the wish that more could be exported, to build up goodwill for the years when competition will be keener. To-day the Government gives the home motor vehicles industry a prior claim for solvents, where they serve only as indirect exports. The coal tar products are also insufficient to meet the needs of the rapidly expanding plastics industry.

Kemball Bishop & Co., Ltd., had been able to accept all orders for the wide range of acids produced, except citric acid, the demand for which now exceeds supply.

More Coal: Fewer Miners

Production of coal last week showed a slight improvement to 4,388,300 tons (4,217,700 tons the week before), consisting of 4,111,800 tons deepmined and 276.500 tons opencast. There was a further reduction of 600 in colliery workers in the week ended May 6.

NEED FOR OIL PLANT

"Shipbuilders Reluctant to Help"

SIR MARK HODGSON, chairman of the Northern Regional Board for Industry, said at a Press conference at Newcastle-on-Tyne last week that the board had been seeking for nearly a year to interest shipbuilders in a scheme for manufacturing certain types of petroleum equipment as a sideline.

There was a demand, which the Americans were trying to meet, for large-diameter fabricated pipes and other items for the Middle East oilfields, and as there was some unemployment among shipbuilding and ship-repairing workers in the North-east the board had felt that the introduction of a new industry would "take up the slack." Shipbuilders seemed reluctant to take up the idea, probably because they had a fair amount of shipbuilding work in hand.

"It will be a pity if we wake up two or three years hence and find that we have missed the boat," he said. "I feel we may have to go to other industries for the work. British oil companies want it to be done in this country because it would be a dollar saver."

Local shipbuilders' associations were still considering the matter, he said, and a final reply from them was expected soon.

[The frequent inability of some suppliers of petroleum equipment to provide essential components within the period specified was recently alleged by representatives of one of the large petroleum companies (THE CHEMICAL AGE, 52, 169.)]

U.S. Sponsored Research

TWELVE new contracts for the performance of physical research were awarded to 12 institutions in the U.S.A., the district of Colombia and Puerto Rico, by the U.S. Atomic Energy Commission during the first quarter of 1950. They are worth $1,345,660.

Fields of work include studies of the fluorides of the rare earth elements; measurement of metal dissolution rates in aqueous solutions of acids and oxidising agents; research on polarography of organic compounds; "hot" atom chemistry and isotopic exchange reactions; synthesis and properties of ion exchange resins; inorganic fluorides; low latitude cosmic ray studies; and polarographic diffusion.

A $1.25 million project to design, construct and operate a 1000 m.e.v. synchrotron at the California Institute of Technology was the largest contract.

Sulphuric Acid Totals

Greater Production and Consumption in the First Quarter

THE production of sulphuric acid and oleum in the United Kingdom in the first quarter of 1950 was 449,085 tons, an increase of 18,895 tons on the figure for the previous quarter. The amount produced by the chamber method (183,589 tons) was 1298 tons less, but the contact process was responsible for 265,496 tons, 15,193 tons more than in October-December, 1949. Consumption, 461,094 tons, was also greater by 18,146 tons.

Increased use, in tons, by individual industries was particularly marked in: dyestuffs, 22,007 (previous quarter 18,816); rayon and transparent paper, 57,001 (51,978); superphosphates, 123,618 (121,545); sulphate of ammonia, 66,884 (63,815); paint and lithopone, 32,006 (30,860); oil refining and petroleum products, 14,886 (18,906).

The full details of production, consumption and stocks, etc., issued by the National Sulphuric Acid Association, Ltd., are contained in the accompanying table.

PRODUCTION OF SULPHURIC ACID AND OLEUM.
(Tons of 100% H_2SO_4)

	Chamber only	Contact only	Chamber and Contact
Stock Jan. 1, 1950 ...	33,713	31,704	65,417
Production	183,589	265,496	449,085
Receipts	52,774	13,514	66,288
Oleum feed	—	2,953	2,953
Adjustments	−269	+112	−157
Use	115,530	105,583	221,113
Despatches	125,611	178,906	304,517
Stock Mar. 31, 1950 ...	28,666	29,290	57,956
Total capacity represented	201,070	275,600	476,670
Percentage production	91.3%	96.3%	94.2%

CONSUMPTION—UNITED KINGDOM

Trade Uses	Tons 100% H_2SO_4
Accumulators	2,447
Agricultural purposes	139
Bichromate and chromic acid	2,862
Bromine	2,646
Clays (fuller's earth, etc.)	2,833
Copper pickling	607
Dealers	5,143
Drugs and fine chemicals	2,862
Dyestuffs and intermediates	22,007
Explosives	3,568
Export	1,026
Glue, gelatine and size	100
Hydrochloric acid	17,140
Hydrofluoric acid	2,294
Iron pickling (incl. tin plate)	25,410
Leather	1,778
Metal extraction	626
Oil refining and petroleum products ...	14,886
Oil (vegetable)	2,933
Paint and lithopone	32,006
Paper, etc.	904
Phosphates (Industrial)	1,085
Plastics, not otherwise classified	5,023
Rayon and transparent paper	57,001
Sewage	2,683
Soap and glycerine	3,041
Sugar refining	141
Sulphate of ammonia	66,884
Sulphates of copper, nickel, etc.	6,068
Sulphate of magnesium	1,628
Superphosphates	123,618
Tar and benzole	4,672
Textile uses	6,587
Unclassified :	
Borax and boracic acid Chlorsulphonic acid Formic acid Oxalic, tartaric and citric acids Phenol (synthetic) Rare earths ... ... Sulphtea of alumina Sulphate of barium Sulphate of zinc and others	38,446
Total	461,094

RAW MATERIALS
Tons

	Pyrites	Spent Oxide	Sulphur & H_2S	Zinc Concentrates	Anhydrite
Stock Jan. 1, 1950 ...	53,637	179,277	67,749	39,250	710
Receipts ...	71,788	57,224	79,626	31,205	44,727
Adjustments ...	−1,535	−422	+391	−57	—
Use	55,984	49,966	86,212	45,474	44,707
Despatches ...	287	3,530 149*	364 63*	9	—
Stock Mar. 31, 1950	67,619	182,434	61,127	24,915	730

* Used at works for purposes other than sulphuric acid manufacture.

Canada's Record Production

PRODUCTION of sulphuric acid in Canada in 1949 was 705,000 tons, a record total and 26,000 tons greater than in 1948. The apparent consumption during the year was 687,700 tons (650,000 in 1948).

Exports of sulphuric acid in 1949 amounted to 17,336 tons, a decrease of 29,478 tons. Imports were 24 tons, compared with 59 tons a year earlier.

The consumption of sulphuric acid by the fertilisers industry in 1948—the largest user—amounted to 467,000 tons, (472,500 tons in 1947). In the heavy chemicals industry, 59,000 tons were used in 1948, in the coke and gas industry 35,200 tons, iron and steel 20,800 tons, explosives 19,700 tons, petroleum refining 19,600 tons, and textiles 12,500 tons.

TRADERS' RÔLE IN CHEMICAL INDUSTRY

Association Chairman on Efficient Distribution

THE essential nature of the services of the merchant in the maintenance on the widest basis of a balanced trade in British industrial chemicals was stressed by the chairman (Mr. C. Norton Stafford) speaking at the annual meeting in London on May 17 of the British Chemical and Dyestuffs Traders' Association.

The chairman, presenting the annual report, touched on some of the many instances in which the intervention by the association had served to facilitate conditions of exchange and transport.

The merchant, he said, had continued to make a very substantial contribution to the United Kingdom export trade in chemicals and the distribution system on the home market continued to be based on the efficient merchanting organisations. These points were emphasised because there was much confused thought with regard to the services of the merchant. If they were to accept the view of some manufacturers, as put forward in the "Report on the Chemical Industry, 1949," the ordinary chemical merchant had almost ceased to exist. That view may have been due to short-sighted thinking, and certainly to an absence of any real knowledge of the position.

Traditional Pattern of Trade

The fact was that Great Britain had always maintained her population by the ability of her merchants to sell the products of the homeland, and with that trade as a foundation to proceed to sell also in the world markets the products of other countries. It was strange that at a time when the country needed more than ever before to increase its world trade that some manufacturers should ignore the vital trading asset built up by British merchants. If the merchanting system were to disappear, conditions would inevitably lead to State or private monopolies, and that would mean narrower markets and restricted choice, with a consequent fall in living standards.

Happily, many British chemical manufacturers were finding the services of merchants most useful, and with their continued co-operation, merchants would more than hold their own in the highly competitive markets which were now developing throughout the world.

Success in meeting foreign competition depended very largely on the comparative efficiency of British industry. It was in savings in production costs, rather than in distributors' margins, that the answer could be found.

The policy of the nationalised undertakings with regard to the services of merchants was a question receiving the consideration of the council from time to time, and should it again be necessary, discussions would be re-opened with the appropriate authority.

Members would be interested to know that a contact between the association and a body representing chemical merchants in Australia has been established with a view to facilitating an approach to any question which might arise out of the trade in chemicals between Australia and the United Kingdom.

National Affairs

The chairman, reviewing some of the association's work during the year as an advisor on Government policy in relation to chemical trading, recalled its collaboration in revising the Key Industry Duty list for exemptions. A number of items of which there had been no imports for many years were deleted.

The commercial relations and exports department of the Board of Trade had invited the co-operation of the association in connection with the international negotiations, which begin in September, for a general agreement on tariffs and trade. The association welcomed any movement which seeks the mitigation of restrictions hampering international trade, and the removal of artificial trade barriers.

An open general import licence was issued during the year covering a whole range of chemicals, and it was hoped that the time was not far distant when the licensing system for regulating imports and exports could be abandoned. Another move towards freer conditions was the reduction in the number of controls operative in the chemical trade.

Cordial relationships continued to be maintained with the various Government departments, and a high measure of co-operation has been attained in the negotiations conducted on behalf of members.

The rising costs of distribution were frequently the subject of criticism by would-be planners who failed to recognise the connection between such costs and the higher charges for the transport and hand-

THE CHEMIST IN INDUSTRY

His Status in a Large Organisation

THE possibility that the individualism of the chemist may be suppressed in a large industrial concern was one of the problems discussed at a meeting of the London and South-Eastern Counties Section of the Royal Institute of Chemistry held in London last March.

The original intention had been to discuss the subject in a general manner. As, however, this had already been done in a number of recent addresses to scientific bodies and in articles in chemical journals, it was decided to examine the organisation of one specific organisation.

A paper on "The Function of the Chemist in a Large Industrial Organisation," was accordingly read by Dr. John Dewar, of the central staff department, I.C.I., Ltd.

In a description of the structure of the company special attention was paid to the varied activities and interests of the constituent parts of the I.C.I. organisation and to the system of central co-ordination of functions.

The method used to introduce entrant graduate chemists to industrial life was outlined, and examples of the types of investigation normally encountered by them were quoted.

The nature of research, development, production, sales, technical service and other work undertaken by I.C.I. chemists was discussed, and an indication given of the technical qualifications and personal qualities required for success in those spheres of operation.

Statistical information was given about the number, distribution and functions of the qualified technical staff in the company, with special reference to the post occupied by chemists.

"Terrifying Machine"

In the discussion which followed, Dr. M. A. Phillips said that his impression of the I.C.I. organisation was that it was "magnificent, but somewhat terrifying." Was there room for initiative? Was there really any decentralisation? The possibility of nationalisation of the chemical industry had been rumoured—perhaps in such an event the civil servants would have the more to fear in being drawn into this terrifying machine.

Dr. Dewar, in reply, referred to his elaboration of the fact that the manufacturing divisions of I.C.I., although not separate legal entities, have much of the character of individual industrial enterprises, common functions being coordinated in varying degrees by a central organisation.

After the initial period of concentrated centralisation a policy of decentralisation had been adopted. Organisational improvements were constantly under review to find the best blend of centralised authority and delegated responsibility.

This point was also dealt with by Dr. C. W. Herd, who presided. The doctor declared that among the many senior and some junior chemists he had met he had never observed the "terror" expected by Dr. Phillips, nor had he heard them complain that they were "just cogs."

The assistance which I.C.I. gave to smaller firms was also acknowledged by the chairman, who said he thought the company's policy was to foster the progress of chemical industry in general.

Prof. Hermann Schmidt-Hebbel, of the biochemistry department of Chile University, was one of the 90 chemists who attended the meeting.

MERCHANT SERVICES

(*continued from previous page*)

ling of goods. Traders could only view with misgiving the ultimate outcome of a policy which accepted an increased wage rate side by side with a reduced output per man hour and often poor service. In one instance reported to the association the charges made for re-packing goods for export were nearly six times greater than they should have been, not because the wage rate was higher, but because the work which should have been completed in one hour had taken six hours.

The unnecessary loss of goods through damage in handling was another matter over which the authorities appeared to have been losing control. It had been necessary for the association to make representations to the National Dock Labour Board asking that the use of hooks in the process of loading and discharging bag cargoes should be discontinued. The action taken by the association was supported by many other trade bodies.

The meeting elected the following officers:—President, Mr. G. S. Bache; vice-president, Mr. C. W. Lovegrove; chairman, Mr. C. Norton Stafford; vice-chairman, Mr. C. H. Wilson; hon. treasurer, Mr. L. S. Heskins; executive council, Messrs. C. C. Hallett, Ian D. Orr D. F. Waugh; hon. auditor, Mr. R. Heap, F.C.R.A.

INDUSTRIAL & RESEARCH INSTRUMENTS

Royal Society Illustrates Recent Advances

EVIDENCE of advances in the production of new means of identification and measurement in a variety of fields was offered at this year's annual conversazione of the Royal Society, at Burlington House, London, W.1, last week. A number of the principal research departments of the universities and industry made distinguished contributions to the exhibition which is associated with the function.

An infra-red spectrometer, shown in operation by the Anglo-Iranian Oil Co., Ltd., has been developed by that company in collaboration with Marconi Instruments, Ltd., and is the first of its kind to be used in industry.

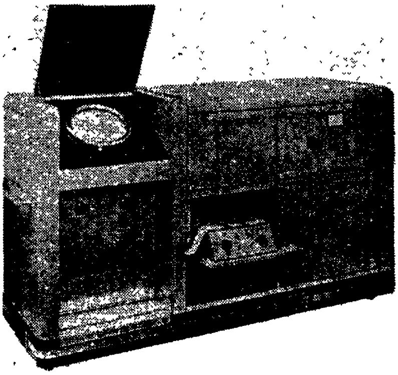
The instrument is being used to investigate catalysts for the desulphurisation of petroleum products. In the present application, a stream of hydrocarbons containing thiophene is passed in admixture with hydrogen over the catalyst and then through the absorption cell of the spectrometer. The variation of thiophene content is followed by the change in the spectrum trace on the cathode-ray screen.

Research scientists of the General Electric Co., Ltd., have developed some new phosphors, responsive to 2537 Å radiation, which enable white light, suitable for general lighting, to be obtained from a single fluorescent material. The phosphors, which were demonstrated by the company, are of alkaline earth halophosphate composition, activated by antimony and manganese.

Pure Metals

A method of preparing iron and iron alloys of high purity on a 25-lb. scale was described by the Metallurgy Division of the National Physical Laboratory.

The base material, a Swedish iron of low metallic impurity, is melted in air in a basic lined furnace. The carbon, silicon, chromium, manganese and sulphur are reduced to less than 0.01 per cent, but the oxygen content is greatly increased. The oxidised iron is remelted in pure aluminium crucibles in an atmosphere of dry hydrogen which reduces the oxygen and nitrogen contents to 0.002 per cent, or less. The purified molten iron is then cast in a steel mould, the hydrogen pressure having been lowered to about 6 cm. of Hg. Rolled to a bar of ⅝ in. diameter, the ingot supplies sufficient material for a wide series of tests.



[Courtesy of Anglo-Iranian Oil Co., Ltd., and Marconi Instruments, Ltd.

The new infra-red spectrometer employing cathode-ray presentation

An interferometer microscope was contributed by Mr. J. Dyson, of Associated Electrical Industries, Ltd. Two fields of view, one containing the image of the light source, the other the image of the light source with the image superimposed, are brought into coincidence and the object is revealed by the effect of its optical thickness on the interference phenomena which are produced.

A portable leak detector, demonstrated by the British Thomson-Houston Co., Ltd., is used to discover traces of halogen vapour and is said to have many industrial applications. Its operation is based on the increase in positive ion formation at a heated platinum surface when the halogen concentration in the surrounding air increases. The flexibility of the instrument is indicated by its ability to detect 0.01 per cent trichlorethylene in mineral oil.

The high speed electronic camera which was the exhibit of the Department of Physical Chemistry, Cambridge, can show detail occurring in 10^{-8} to 10^{-9} sec.

An image converter tube has been used to take photographs of the same general form as those obtained from drum cameras. The display of the event as a function of time has been achieved by electronic deflection of the electron stream. The method is stated to give better resolution, higher useful intensity, and writing speeds 100 times faster than formerly attainable.

PARLIAMENTARY TOPICS

REPLYING to a question regarding the hazards involved in the use of insecticides based on the organic phosphorus compound, parathion, Mr. T. Williams, Minister of Agriculture, said that every opportunity was being taken through the National Agricultural Advisory Service and the Press to make known the dangers of these substances and how they might be avoided. If these were heeded, together with the manufacturers' instructions, there should be no danger either to users or consumers. Compulsory provision of protective clothing for those using dangerous sprays was, however, one of the recommendations of the Gowers' Committee. The situation was, nevertheless, being closely watched by the Agricultural Research Council, which was in close touch with the Medical Research Council at the Ministry's Plant Pathological Laboratory.

INFECTION by bacteria of a product named Edifas, formerly called Cellofas edible grade, manufactured by Imperial Chemical Industries, Ltd., was alleged by Mr. J. McGovern, who alleged this material supplied to bakers was dangerous to health and asked the Minister of Health to take steps to prohibit its use. Mr. F. Willey, Parliamentary Secretary, in reply, said that there was no reason to believe there was any danger to health in use of Edifas. All foodstuffs contained bacteria, and there was no particular significance in the allegation. If more specific information was supplied, he would look into the matter.

REPLYING to questions about the maximum capacity of the British-owned refineries at Haifa, Mr. P. Noel Baker, Minister of Fuel and Power, said that in normal conditions about four million tons of crude oil could be treated in a year. American companies had a right to about one quarter of the products. The value of the British share at present f.o.b. prices, was about £17.5 million in 1947, and about £600,000 in 1949.

ASKED what was the percentage rise in the cost of imports of raw materials and manufactured goods since September, 1949, Mr. H. Rhodes said, on behalf of the Board of Trade, that index numbers of import prices in terms of sterling showed increases between September, 1949 and March, 1950 of 22 per cent (raw materials) and 17½ per cent (manufactured goods).

DYESTUFFS CHANGES

THE announcement that the Depth of Shade Control Order will be lifted from June 1 should mean a greater variety in depth of the four basic dark shades of dyestuffs—brown, navy, olive and wine, and black. Whether or not this will provide more choice for the consumer is in the hands of the dyers. Certain dye works have followed their own inclinations during the control period, using darker shades than specified.

Darker shades, increase the cost of production. They are, however, available in cheap dyes, which do not stand the test of time, and are dull and flat in appearance. It is the brightness of the tone which creates high prices and puts the finishing touch to the shade. The cheaper shades, produced more prolifically, do not necessarily stand up to test for colour fastness. So costs may rise slightly for better class dyes and finishes.

Criticism from overseas markets on the stability of dyes is being voiced in countries where Japanese textiles can be obtained at cheaper prices, and where wage problems are negligible.

April's Lower Exports

THE value of United Kingdom exports in April is provisionally estimated to have been £150 million. Owing to the Easter holidays, the month contained only 23 Customs working days, however, and, adjusted to a standard month of 26 days, the total would be £169.5 million.

This was £4.5 million less than the average in the first quarter of this year, but 12 per cent above the average of £151.5 million for 1949. Exports to the U.S.A., adjusted to a standard month of 26 working days, were the lowest since last October.

Imports in April were provisionally valued at £211 million and re-exports at £6 million, so that excess of imports (valued c.i.f.) over exports and re-exports (valued f.o.b.) was £55 million. Adverse visible balance for the first four months was approximately £125 million.

Lead Prices Raised

Further increases in the price of good soft pig lead were announced by the Ministry of Supply last week. The first rise of £2 a ton was announced on Wednesday, May 10 and was followed the next day by an immediate increase of £4 a ton, delivered, bringing the price from £92 to £96 a ton.

ENGINEERING ADVANCES AT BIRMINGHAM

Plastics and Chemical Machinery at the BIF

CHEMICAL engineering was again well represented in the exhibits at the Castle Bromwich (Birmingham) section of the BIF. Engineering exhibits generally numbered more than last year—486 against 482 in 1949—and a fairly large proportion of these was wholly or in part for the service of chemical and allied industries. On several stands were erected full-scale machines and chemical equipment, on others, scale models were shown.

Most forms of chemical machinery and equipment were represented in the comprehensive exhibits—chemical plant in stainless steel, copper, aluminium and other metals, and glass, pumps, stoneware and porcelain plant, tanks and tank linings, laboratory instruments—to mention a few, A modern note was struck by the larger number of plastics machinery exhibits; there were 19 of various sorts.

A reporter of THE CHEMICAL AGE, who made a tour of the Birmingham fair last week, heard encouraging accounts of good overseas business having been transacted on some of the chemical engineering stands. In practically all cases the number and character of the inquiries received was regarded as very satisfactory particularly on the early days. One firm of plastic injection moulding machine makers reported having booked £20,000 worth of home and overseas business in the first two days of the fair. An interesting order from the Continent was from the municipality of Amsterdam for a £5000 magnetic coal separating plant to be used in a new power station.

Buyers from many countries, including Russia, visited the chemical engineering and other stands, and commendation was expressed of the quality of the current engineering products. One of the parties of overseas buyers was from the Hashimite Kingdom of Jordan.

* * *

PERHAPS the most spectacular of any of the chemical plant exhibits, and one which attracted considerable attention from visitors, was the assembly of large-scale plants by the LONDON ALUMINIUM CO., LTD. One scale model, in aluminium, was of a Diamond plant for the recovery of glacial acetic acid. A central position was given to a Merz pilot-scale plant, also in aluminium,

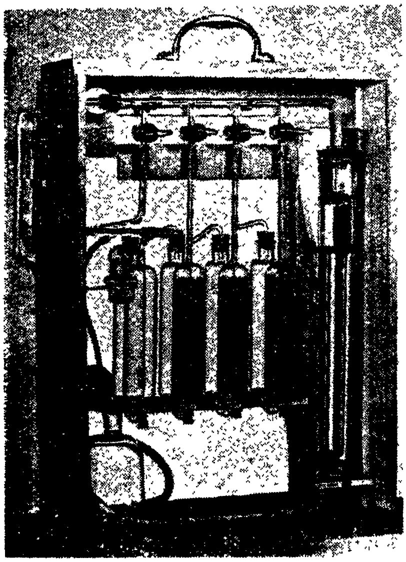
Front left: Scale model of "Diamond" plant, in aluminium, for the recovery of glacial acetic acid. Centre back: Merz pilot plant, in aluminium, for solvent extraction of sugar can wax from filter press mud. Centre front: Stainless steel spray column for gas scrubbing. Extreme right: Hand-made aluminium sphere, 6 ft. 6 in. diameter, for high voltage tests, suitable for 2 million volts gas testing.

[Courtesy of the London Aluminium Co., Ltd.

for the solvent extraction of oils, fats and waxes. This plant was specially designed for the extraction of sugar cane wax from filter press material. On the corner of the stand was a large aluminium sphere for high voltage testing. This, 6 ft. 6 in. in diameter, hand-made throughout, is suitable for 2 million volts gap testing.

* * *

SEVERAL full-scale items of scientific glass equipment were shown by **Glass Developments, Ltd.** These included the portable Orsat lunge apparatus for analysis of carbon dioxide and carbon monoxide, hydrogen and oxygen. This is provided with four Stanier pipettes, spirit lamp with adjustable holder, and palladium-asbestos capillary tube, the whole being contained in a mahogany case.

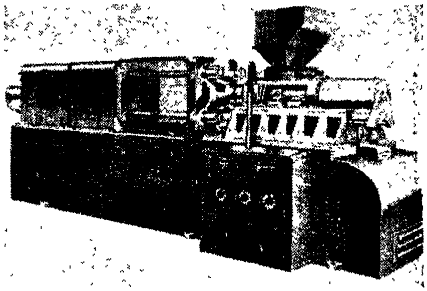


Orsat lunge apparatus for analysis of carbon monoxide and dioxide, hydrogen, and oxygen (Glass Developments, Ltd.)

Also shown was the Haldane gas analysis set—hydraulic pattern—which has needle valve control and is mounted on opal Perspex panel; the Haldane mine-air analysis apparatus and numerous examples and photographs of the firm's productions of laboratory furniture and equipment.

* * *

AMONG the exhibits of plastics machinery, that of **R. H. Windsor, Ltd.**, attracted notice by the fact that it included a full-scale injection moulding machine of which working demonstrations were given.



Model S.H.8/10 plastic injection moulding machine, with an hourly plasticising capacity of 50-60 lb. (R. H. Windsor, Ltd.)

This machine moulds eight to ten oz. per shot, and the plasticising capacity is 50-60 lb. per hour. The total injection pressure is 114,000 lb., and the pressure on material 20,000 lb. p.s.i. The machine requires a floor space of 18 ft. by 3 ft.

* * *

SHOWN on the stand of **E.M.B. Co., Ltd.**, was an injection moulding machine claimed to be capable of moulding all available thermo-plastic materials. It is powered by compressed air, and has a timed injection cycle which is said to prevent scamped mouldings. This timing device is now the standard equipment of this design.

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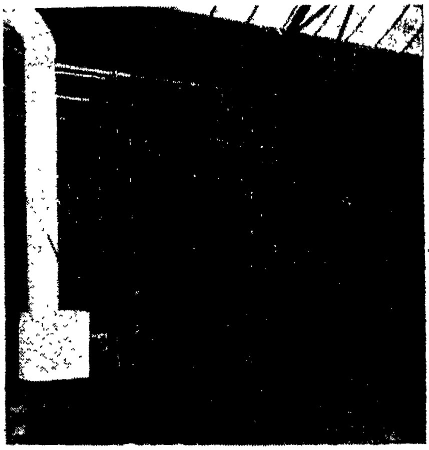
ONE and two ounce capacity plastics injection moulding machines were in the exhibit of **Hupfield Bros., Ltd.** These are self-



[Courtesy of James Jobling & Co. Ltd.

Part of one of the large capacity spray evaporators or coolers being produced in Perspex glass contained, semi-automatic, and hydraulically operated. The plasticising capacity of the 1-oz. machine is 9 lb. per hour, and of the 2-oz. 16 lb.

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THE greater part of the stand of **Thompson Bros. (Bilston), Ltd.**, was occupied by a large solid stainless steel inner shell of a trough-type horizontal jacketed mixer. With dimensions 20 ft. long by 10 ft. deep by 8 ft. wide, it was believed to be the largest single exhibit in the Castle Bromwich section. This shell varies in thickness from ¼ in. to ½ in. and is internally polished. The total finished weight is 45 tons. Alongside was the shaft of this mixer, which attracted attention by the fact that it was built up from a mild steel forging and covered with stainless steel. Other fusion welded items for the chemical and allied trades included a mild steel pan lined with pigmented phenolic lacquer.

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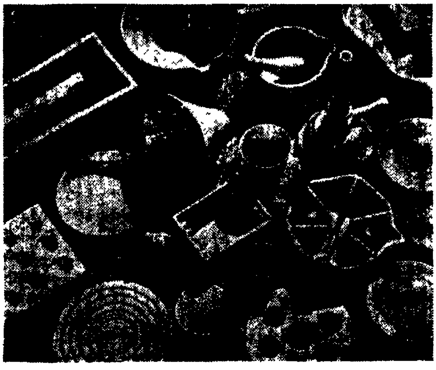
ON the stand of **Prodorite, Ltd.**, which specialises in proofing processes in acid-proofing processes and proofing materials for all industries, was a scale model of a continuous strip pickling plant which this firm is shortly to install in the works of the Steel Company of Wales. Typical of the kind of work for which there is now an increasing demand were the acid-proofed sections of brick-built plant, treated floorings and wall surfaces, tanks, pipes, etc., and samples of acid- and alkali-resisting cements and paints.

* * *

A LARGE-SCALE model of chemical stoneware fume absorption towers on the stand of **Doulton & Co., Ltd.**, was the replica of one in use at the works of Evans Medical Supplies, Ltd., Speke, Liverpool. Also shown here was a wide range of other chemical stoneware articles and laboratory porcelain ware, and many examples of high tension and other industrial insulators in porcelain.



A group of laboratory items in porcelain shown by Doulton and Co., Ltd.

Demonstrating the services to the glass worker of some of the principal supplies offered by Chance Brothers, Ltd.: the demonstrator here uses a Flamemaster torch and Neodex lenses to protect his eyes from the glare of the sodium flame as he moulds the neck on to a large Hysil flask

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IN addition to showing a representative range of its standard temperature measuring instruments, draught and pressure gauges, recorders, etc., **The Cambridge Instrument Co., Ltd.**, was handling inquiries for a new direct-reading pH indicator which is in course of development. This will be characterised by portability, robustness and great stability, and will record the full range of 0 to 14 pH. It will be directly readable to 0.1 and by estimation easily to 0.05. It will be all mains operated.

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THE exhibit of **Negretti & Zambra, Ltd.**, comprised a range of its industrial, meteorological, and aeronautical instruments, including temperature control apparatus, pyrometers, hygrometers, level indicators, etc.

Protective Clothing

A SPECIALLY supple PVC glove for laboratory work made on an interlock fabric base, affording greater sensitivity in use in precision works, is among the new developments shown by **James North & Sons, Ltd.**, at the Earls Court section in London. A complete range of industrial protective clothing is on view.

VITREOUS ENAMEL FAILURE

Source of Defects in Chemical Plant

SOME of the defects of vitreous enamel used as lining of chemical plant were reviewed at a recent meeting in Manchester of the N.W. branch of the Institution of Chemical Engineers in the course of a paper by G. E. Charlish and E. J. Heeley.*

The facts were presented from the critical viewpoint of the user, but it was acknowledged that current methods of experimental stress analysis should put in the hands of designers of vitreous enamelled plants means of producing more reliable plant than was possible when the design of such items was evolved empirically.

Mr. Heeley, who read the paper, said vitreous enamelled plant is unreliable, it may fail under mild conditions and withstand onerous ones. Enamel coatings have a characteristic bubble structure (illustrated by photomicrographs of cross-sections of typical commercial and experimental enamels). The small bubbles have no serious effect on the protection given, provided no path exists by which corrosive liquids can reach the metal.

The unreliability of enamelled plant was attributed to defects in the enamel layer. The defects are large voids revealed by a high frequency spark test, caused by loss of enamel by chipping or flaking and, occasionally, inadequate resistance to acids. Defects caused by mechanical damage are craze cracks and fractures in the enamel due to overstrain of the basis metal. Large voids are the most common defect; they can be caused by impurities in the frit, not (in the authors' opinion) by gas occluded by the metal.

Enamels for chemical plant differ in composition from those for domestic ware. High localised stresses in the basis metal must be avoided because they may cause the enamel to fracture and flake off.

U.S. Hydrazine Production

LARGE-SCALE production of hydrazine in the near future is expected to be accomplished by the Mathieson Chemical Corporation, which is now seeking process improvements to lower the cost and increase output. The company is producing hydrazine in semi-commercial quantities for the U.S. armed forces and the chemical industry, using its own basic chemicals, ammonia, chlorine and caustic soda. In the post-war years interest in the use of hydrazine hydrate as a fuel has increased.

IRONFOUNDING PROGRESS

New Laboratories at Blantyre

PROGRESS in technique and output in ironfounding, one of Scotland's oldest major industries, was emphasised by Lord Bilsland, speaking at a luncheon in Glasgow last week after he had opened the new laboratories of the British Cast Iron Research Association at Blantyre Industrial Estate.

In a scientific age, declared Lord Bilsland, Scotland had to be aware of the fundamental work of the scientist in opening up opportunities of trade and progress. He considered the new laboratories would perform an invaluable service in proving the technical efficiency of the products of the industry and in dealing with problems of materials, processes, and production. The whole industry was fortunate in having an efficient and active research association.

The industry had passed from the era of craft to technical control, in which the skill of the moulder or coremaker was being reinforced by the knowledge of the metallurgist.

Mr. P. H. Wilson, president of the association, said that the foundry industry was moving towards higher technical control. Shortage of metallurgists and technicians and high expenditure on equipment made a strong case for the consideration of regional laboratories, and he hoped Scottish ironfounders would make full use of the facilities at Blantyre.

Polish Data on Cathodic Protection

AN article by St. Minc and L. Stolarczyk in *Przemysl Chemiczny* (2), 3, on the cathodic protection of ship steel sheet gives data on the potential of steel plates when dipped in sodium chloride solution (3.5 per cent NaCl + 0.1 per cent H_2O) and cathodically protected from corrosion by zinc and aluminium alloys. Plates protected by alloys containing 30-40 per cent aluminium and 60-70 per cent zinc show the lowest potential.

The potential is a measure of protective current and is therefore indicative of the degree of cathodic protection. The second part of the article deals with measurements of the potential of steel plates dipped in the same solution and coated with varnish and red lead as pigment. Plates coated with films containing the smallest amount of PbO showed the highest potential.

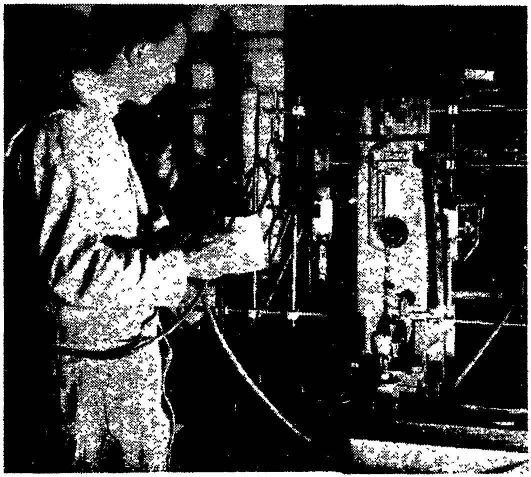
NEW CENTRE OF MEDICAL RESEARCH

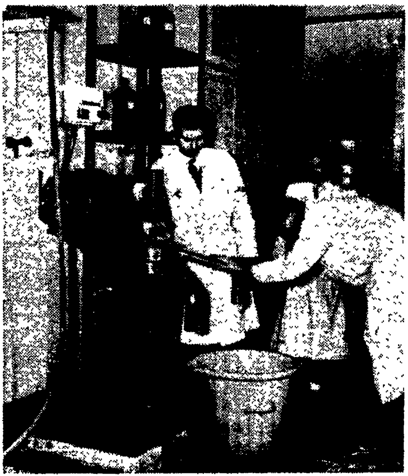
Larger Rôle of Chemistry in Medical Science

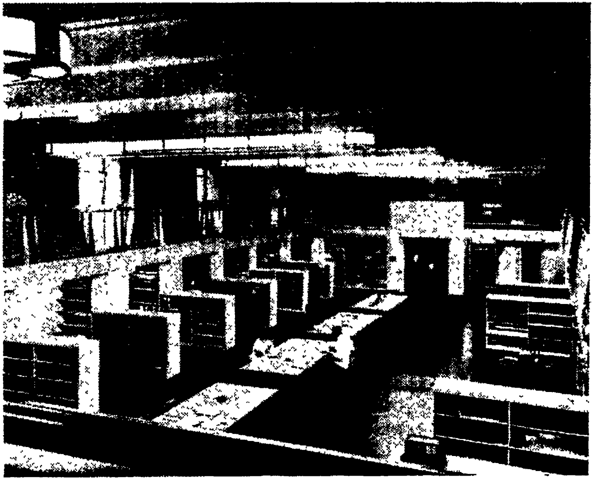
THE great growth of the scope and importance of the several departments of chemistry in contemporary medicine is exemplified more abundantly than ever before in the form of the new headquarters at Ridgeway, Mill Hill, of the National Institute of Medical Research. The new building and the whole establishment bears witness also to another comparatively new aspect of scientific endeavour to which attention was drawn by H.M. the King, responding to an address of welcome before he and the Queen toured all the departments on May 5. " The work of the institute," he said, " exemplifies that spirit which inspires the State and science to work together for the health and happiness of mankind . . . without distinction of race, colour or creed."

The theme of chemistry is given full scope by the devotion to it of much of the

(*continued on page 752*)







Above: Dr. G. J. Popjak sets up a vacuum distillation apparatus for fractionating fatty acids in the biochemistry laboratories, where radioactive isotope techniques are being used. Above, right: Indicative of some of the advanced examples of centrifuge design is this large-scale apparatus in the bio-physics department. Right: Part of the ample and well designed library, having a gallery for easier access to some of the 20,000 scientific works it contains

Fuller Scope for Coal Tar Research

New Laboratories at Gomersal

A FURTHER step to supply the need for research to widen the range and scope of the products from coal tar was taken last week, when Sir John Anderson opened the new laboratories of the Coal Tar Research Association at Gomersal, near Leeds.

The premises, formerly the Union Mills, were leased from the Ministry of Supply. A survey was made by the director, Dr. D. McNeil in consultation with Mr. J. Steadman, civil engineer of the Midland Tar Distillers, Ltd. Contractors moved in early in 1949, the office accommodation was ready by June and immediately occupied.

The first laboratory was ready by September, and research on a small scale was begun. By Christmas the research station had been completed and a staff of 55 recruited, including 16 graduate chemists and 18 assistants.

Conversion of the old buildings to laboratories posed problems which are not met with in designing and building on a vacant site. In addition, the Coal Tar Research Association was a new venture without existing apparatus or plant and without research background which would enable "tailor-made" laboratories to be designed.

The premises consist of a large single storey building having a total floor area of 24,500 sq. ft. and a two-storey brick building containing 7000 sq. ft. floor area. In the latter the upper floor has been divided into offices, library, a conference room and dining room. Part of the lower storey houses the stores and the glass blowers' workshops.

Laboratories are all situated in the area between the south wall of the main building and the furthest dividing wall, which has been extended by a partition. This has been divided by glazed partitions into six main and two smaller laboratories, a balance room, an autoclave block house and offices for four section leaders.

Space has been provided for semi-technical plant where need arises, and there is a fully-equipped workshop in another part of the building.

The analytical, organic, and general laboratories have supplies of water, gas and electric power and a centre low shelf for reagent bottles. In the physical laboratories there are heavier electric power supplies.

Fume cupboards are of two types: open-fronted for handling irritant but non-toxic vapours and sash-fronted for complete protection against poisonous materials.

In the still room is housed a battery of six automatic stills of efficiencies ranging from 25 to 80 theoretical plates. No benches are provided in the catalytic laboratory. Stout wooden tables are provided, around which the various units can be built.

NEW CENTRE OF MEDICAL RESEARCH

(*continued from previous page*)

north-east and north-west wings, the latter being given over almost entirely to chemotherapy, the expansion of which was one of the objectives influencing the removal from the relatively cramped quarters the institute had occupied at Hampstead for some 30 years. Sharing the same wing, on the ground floor are the organic chemistry laboratories (Dr. J. Walker), notably concerned now with anti-tubercular drugs and the identification of plant substances from which cortisone may be produced.

The biochemistry department (Dr. A. Neuberger) has been favoured with the whole of the ground floor and part of the first floor of the north-east wing, in which the elaborate existing equipment concerned largely with advancing knowledge of the thyroid, amino-acid metabolism and porphyrin, is soon to be supplemented by a radiochemical laboratory. The synthesis of compounds to make use of radioactive isotopes is one of the objectives.

Other chemistry departments sharing the north-east wing are the bacterial chemistry division (Dr. M. R. Pollock) and the division of physical chemistry (Dr. W. J. Elford).

The common characteristics of all departments is the great advance in the standard of equipment and of modern laboratory fitting and the closer collaboration between all sections of research, an established policy which the present layout is well designed to advance. Typical of the very advanced standard of equipment is the provision in the division of biophysics of two electron microscopes, electrophoresis apparatus, a mass spectrometer for stable isotopes, new types of centrifuges and freezedryers and ultrasonic machines. This supplements an ample range of more traditional scientific equipment and much of it finds counterparts in other departments.

A POSSIBLE RIVAL OF PYRETHRUM

Some Economic and Chemical Merits of Allethrin

From A CORRESPONDENT

THE employment of pyrethrum as a natural and powerful insecticide has been established for more than a century. The extract from tropical flowers of the chrysanthemum species, it has been increasingly used in modern times as the basis of domestic sprays and insect powders. It has also been used, to a rather less extent, in the control of horticultural crop pests.

Its widest use is in the United States, where 20 million lb. of crude pyrethrum is annually imported in normal times. The crude natural product has, therefore, exceptional economic significance since it is one of the few materials which the U.S.A. does not produce substantially and thus represents an important sterling area export to America.

Increasing Demand

In 1937 Japan was the principal supplier,. providing nearly 18 million lb. of America's total imports of 20 million lb. In that year, Kenya's contribution amounted only to rather less than 1.5 million lb. Steady expansion has enabled Kenya to supply the major part of America's needs—in 1945 Kenya provided 12.5 million lb. out of a total import of 18 million lb. U.S. scientists visited Kenya after the war on a mission to encourage the further expansion of pyrethrum production. Despite the use of DDT and other new synthetic insecticides, the demand for pyrethrum has consistently exceeded supply, and in the last two years the price of crude pyrethrum has risen by about 25 per cent.

As a domestic insecticide, pyrethrum has two widely recognised advantages. It has a much more rapid " knock-down " action than DDT. Its second merit is its very low toxicity to humans and animals.

Its prospects of extended use in agriculture have probably been improved as a result of the introduction of DDT. The latter has shown how great are the benefits livestock pest control offers in milk and meat production, while the knowledge that DDT may act as a cumulative poison which tends to build up in animal fats has led to its virtual exclusion from dairy farming in America, the Food and Drugs Administration having refused to permit any tolerance for DDT content in dairy products. The gap that has been left could be filled, at least partially, by pyrethrum.

Even in the domestic insecticide field, DDT has increased rather than reduced the opportunities for pyrethrum. Manufacturers of household fly sprays based upon DDT found it desirable to combine pyrethrum with DDT to procure rapid knock-down action as well as residual effect. Recent evidence that surviving flies breed DDT-resistant generations has further enhanced the claims of pyrethrum.

Synthetic Competitor

In the spring of 1949, it was announced by the U.S. Department of Agriculture that pyrethrum had been " synthesised " in laboratory-scale experiments. It was a limited synthesis, because the new synthetic material was actually a homologue of one of the active ingredients of natural pyrethrum. At this stage it was generally considered that commercial development would require several years of further research. In 12 months, however, fairly large-scale production has been achieved by one American manufacturer (the Union Carbide and Carbon Corporation). In March, 1950, tonnage production and distribution was announced.

It is not claimed that the synthetic material is as effective as natural pyrethrum, but it appears to possess closely comparable properties. Such a synthetic near-substitute is certain to be a serious competitor of the natural product of Kenya.

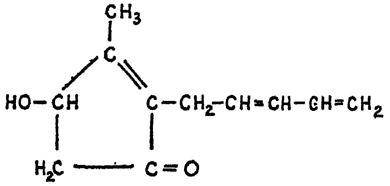
Production Difficulties

Pyrethrum can be successfully cropped only in high altitude tropical climates and a large amount of hand labour is required in harvesting and production of the crude material; these factors prevent natural production at low cost and in unlimited quantities. Moreover, it takes some years to expand pyrethrum production, as is generally the case with materials whose supply depends upon farm cropping.

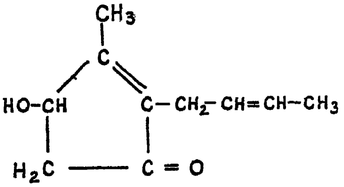
The chemical synthesis is far from simple. Until quite recently, the insecticidal properties of crude pyrethrum were believed to depend upon two ingredients, complex esters known as pyrethrin I and pyrethin II. The chemical constitution of the pyrethrins was revealed in 1924; they are respectively esters of chrysanthemum monocarboxylic acid and the similar dicarboxylic acid with the cyclopentenolone known as pyrethrolone.

Most of the further structural research on the pyrethrin esters was aimed at determining the precise arrangement of the pyrethrolone part of their molecules. In the course of it, two further insecticidal ingredients in pyrethrum were recently isolated; these were again closely related to one another and to the pyrethrins, and were named cinerin I and cinerin II. They were the similar esters of cinerolone.

The structural formulæ of pyrethrolone and cinerolone are these:



Pyrethrolone



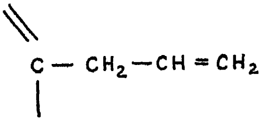
Cinerolone

British research in 1945 had established a synthesis for chrysanthemum monocarboxylic acid. American research began in early 1948 and succeeded before the end of that year in synthesising a stereo-isomer of cinerolone.

When this isomer was esterified with synthesised chrysanthemum monocarboxylic acid, a material as powerfully toxic as the natural cinerin I was produced. Furthermore, homologues of this synthetic substance have been produced by modifying the side-chain attached to the pentose ring of cinerolone, and some of these homologous esters proved to be more toxic to insects.

One of these, the allyl homologue, was claimed to be more toxic in some conditions than the combined active principles of natural pyrethrum. It is this allyl homologue which has achieved fairly large-scale commercial production this spring. It has been given the official and more convenient name of allethrin.

According to early accounts from the U.S.A., the synthesis requires 12 stages and 11 intermediates must be processed. Altogether 200 lb. of material have to be handled to yield 1 lb. of allethrin. Although this points to costly production, it must be weighed against a comparable defect of the natural method: pyrethum flowers have an average content of 1.2 per cent of these toxic esters; about 7000 tons of flowers flown to the United States from Kenya in the war produced only 80 tons of active pyrethrum insecticide.



Synthetic allyl homologue of cinerin 1

During the wartime uncertainty of pyrethrum supply it was found that its insecticidal properties could be "stretched" by incorporating synergists, particularly piperonyl butoxide. It has already been established that the synthetic allethrin is equally responsive to this help from synergists.

Price Problems

Allethrin has knockdown toxic properties similar to those of pyrethrum. It is said to have a superior residual effect; this will be an advantage in domestic and sanitary uses but possibly a disadvantage in crop protection. Like the natural insecticide, it can be mixed with DDT.

The price of allethrin is said to be 10-15 per cent less than that of the natural material. If the usual course of economics associated with synthesis production is followed this price may be expected to fall steadily as output increases and processing is improved. Post-war discussions between Kenya and the U.S. have only failed to arrest a steady rise of the price of crude pyrethrum which, according to growers, is unavoidable if this crop is to be expanded in preference to others. There is, however, one means by which the price of the natural product could be sharply reduced without making its cropping uneconomic—by extracting the crude flowers in Africa and thus reducing the disproportionately high transport costs incurred in exporting 100 tons which yield only about 1.2 tons of concentrated insecticide in the importer's factories. It remains to be seen whether Kenya can give this answer to a sudden synthetic challenge.

SOURCES

E. R. de Ong, "Chemistry and Uses of Insecticides," 1948.

R. O. Whyte, "Farming for Industry," 1948.

Schecter, Green and LaForge, *J. Am. Chem. Soc.*, 71, 1517, 1949.

Idem., *Agric. Chemicals*, 4, 6, 57, 1949.

Editorial, *Chem. Industries*, 66, 5, 506, 1950.

U.S. ADDITION TO PLASTICS SOURCES

Useful Attributes of Alpha-Methyl Styrene

From A CORRESPONDENT

THE unsaturated pure hydrocarbon, α-methyl styrene, has been known to organic chemists for many years, but only recently has it been manufactured on a commercial scale (in the U.S.A.) from readily available raw materials—propylene and benzene.

The boiling point of α-methyl styrene monomer is 165.38° C. (760 mm. mercury); flash point 136° F.; fire point 136° F. and index of refraction at 25° C. is 1.53586. The viscosity in centipoises at 20° C. is 0.940.

Like styrene, the α-methyl styrene responds to the usual polymerisation processes, but not so readily, exhibiting little tendency to polymerise at temperatures much below 250° C. The polymers of α-methyl styrene exist in both the unsaturated and saturated forms, the latter being produced from the former by cyclisation.

Controlled Polymerisation

Catalytic polymerisation of α-methyl styrene can be carried out by using several catalysts, the most important being concentrated sulphuric acid, stannic chloride, certain solid catalysts such as metallic powders, boron trifluoride, activated bleaching earths, etc. It is possible to obtain mixed saturated and unsaturated dimers, trimers and tetramers by using 70-90 per cent aqueous sulphuric acid and saturated dimer by employing concentrated sulphuric acid.

With stannic chloride a very vigorous polymerisation takes place to form saturated low molecular weight polymers. It is possible, therefore, by careful choice of catalyst and regulation of polymerisation conditions to prepare almost any type of polymer.

High molecular weight polymers can be produced by solution polymerisation at extremely low temperatures using ionic catalysts. Work carried out by the Research Department of the Dow Chemical Company has shown that as the temperature of polymerisation decreases from 20° C. to − 100° C., the average molecular weight of the polymer increases, slowly but linearly, from 20,000 to 30,000. Below − 100° C. the molecular weight tends to rise very abruptly, reaching values as high as 84,000 at − 130° C.

High polymers made from α-methyl styrene can be moulded into clean transparent articles possessing good strength and subject to a melting point of 200° C. —higher than that of polystyrene. Although the impact strength of the new polymer is somewhat inferior to that of polystyrene the polymer possesses certain important advantages, e.g., it is resistant to distortion in boiling water and unaffected by petrol.

Co-polymers

Of considerable interest is the preparation of co-polymers from α-methyl styrene, e.g., with vinyl methyl ketone (U.S. Patent 1,937,063), with vinylidene chloride (U.S. Patent 2,160,932), with butadiene (U.S. Patent 1,938,730) and with styrene (U.S. Patent 2,401,266).

In synthetic rubber manufacture the partial substitution of α-methyl styrene for styrene in a GR-S formula, using 25 parts of styrene to 75 parts butadiene, produces a somewhat inferior rubber, but a copolymer containing 80 parts butadiene and 20 parts of α-methyl styrene appears to be superior to most butadiene-styrene rubbers.

Of considerable importance is the fact that low-weight polymers of α-methyl styrene are finding growing uses as plasticisers for various resins, colourless viscous liquids possessing wide compatibility and ready solubility.

Paint manufacturers are showing some interest in styrenated oil compositions made by reacting the monomers with drying oils or oleo resinous compositions. Here the α-methyl styrene is generally employed in conjunction with styrene, the recommended mixture being 65-75 per cent styrene and 25-35 per cent α-methyl styrene.

Australian Plastics

Recent developments in the Australian plastics industry include production of PVC polymer at the plant of Imperial Chemical Industries of Australia and New Zealand, Ltd., at Botany, N.S.W., and the establishment of a new urea plant at Deer Park, Victoria, by the same company. The new factories are claimed to be among the most modern of their kind in the Southern Hemisphere.

THE CHEMIST'S BOOKSHELF

ANTIMON UND SEINE VERHUETTUNG. By Dipl.-Ing. Walter Wendt. 1950. Franz Deuticke Verlag, Vienna. Pp. 104. $2.

THIS is a book by an expert who spent his career on the metallurgy of antimony and modernised the Slovak smelting plant at Vajskovà, one of the most important plants in Europe. The book is well illustrated with 80 photographs, drawings and sketches and contains 23 instructive tables. It presents a comprehensive international bibliography.

Discussing the comparatively modern metallurgy of antimony, it reviews in an historical introduction the development of plants in Slovakia, Jugoslavia, Germany and China. Starting with the raw materials and their enrichment by flotation, as practised in Europe and the U.S.A., particularly as a means of upgrading stibnite, the book describes in detail the blast furnace process and reviews the production of the raw regulus, its refining and the utilisation of the slags (de-arsenisation).

This process as a means of putting arsenic minerals into the tailing has simplified antimony smelting, so that the de-arsenification of ores or metal is now much easier. The possibilities of extracting lead and rare metals, particularly gold, are the subject of special chapters. The blast furnace smelting as well as the refining process, the electrolysis, the condensation and some new patented methods are well described.

The following chapters deal with the properties, uses, and analysis of antimony. Refining of the metal and starring of the final product are emphasised. This custom of marking the cakes of metal with the characteristic stars on their proper surface is mistakenly taken as a guarantee of purity. The de-leading of antimony is a section of interest to processors of antimonial scrap lead.

A report of the U.S. Bureau of Mines dealing with this volume has urged that it would be a distinct service for someone to translate the book into English.

Dyeing and Finishing Charges

The Spun Rayon Fabric Dyers Group has issued a new price list for dyeing, finishing, desizing and making-up of 100 per cent spun rayon fabrics and mixtures of spun rayon with other fibres, to dyers, converters, and others. The basic rates are practically the same as last year's, which are now withdrawn.

INEXHAUSTIBLE NITROGEN

THE importance of the nitrogen cycle in nature, which ensures that, unlike other natural resources generally, our vast reserves of atmospheric nitrogen are never likely to become exhausted, was discussed by Section B (chemistry) at the annual meeting of the British Association, held last year at Newcastle. A summary of the discussion which was introduced by Professor G. R. Clemo is given in *The Advancement of Science* (Vol. VII, No. 25) the association's quarterly publication.

Among the many groups of naturally occurring nitrogenous substances, the professor made special mention of chloromycetin, the first organic nitro compound to be discovered in nature and containing the fundamental C_6C_3 unit characteristic of many plant products.

Various ways in which chemistry can assist agriculture were also discussed and a report, edited by Dr. G. I. Higson, under the title of "Chemistry and the Food Supply" is also reproduced, giving the main points from five papers.

Other interesting papers reproduced in this issue include "Modern Theories of the Origin of the Universe," by Professor Herbert Dingle; "Algae and Calcareous Rocks," by Professor F. E. Fritch; and "Biological Aspects of River Pollution," by Dr. B. A. Southgate.

The History of Chemistry

CHEMISTS concerned with the historic development of their subject and students in their third year and above will appreciate a course of six lectures and demonstrations to be given in June and July at East Ham Technical College, Barking Road, E.6. The series entitled "The History of Chemistry" will be given by H. H. Neville on Monday evenings from 6.30 to 9 o'clock.

The origins of modern chemistry will be the initial subject on June 5, followed by: the atomic theory—early electrochemical ideas (June 12); early ideas on molecular structure of organic compounds (June 19); the development of structural theory and of synthetic chemistry (June 26); inorganic and industrial chemistry in the 19th century (July 3); and the development of physical chemistry (July 10).

Pensions Scheme Extended

A pensions scheme for widows and orphans has been adopted by the Dunlop organisation. Widows will receive pensions up to £260 a year.

Technical Publications

A VERY wide range of laboratory supplies, examples of which are now being shown in the company's BIF exhibits (C61, Olympia) is described and illustrated in a series of folders newly issued by W. & J. George & Becker, Ltd. These supplement the literature on modern balances and describe and illustrate the phenolic plastic filter pump, a range of burners, precision magnetometer, the D'Arsonval galvanometer, optical demonstration apparatus and resistance boxes.

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SOME of the ways in which the atomic pile is serving scientific investigation are discussed by Sir John Cockroft in the April issue of *Endeavour*, the quarterly scientific review, published by I.C.I., Ltd. The chemical constitution of amber—a mixture of various resinous substances approximating to $C_{10}H_{16}O$, which also contains small amounts of inorganic compounds such as the chlorides and sulphates of calcium and magnesium—is described in an article by G. Kirchner, which is illustrated by colour plates.

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AMONG the many useful services of the Department of Scientific and Industrial Research is the periodical publication by the Overseas Liaison Division of lists of forthcoming international scientific and technical conferences held in Great Britain or overseas, of interest to research laboratories (Government, industrial or academic), and to individual scientists. List No. 7 (March, 1950) is now available and covers the current year and some principal dates in 1951 and 1952. Exhibitions of particular scientific interest are included.

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TIMBER, wool and cereals are subjects of the three new booklets now available in the Raw Material Survey series being published by the Purchasing Officers' Association. A total of 17 titles is planned, including non-ferrous metals, oils and fats, natural and synthetic fibres, chemicals and fertilisers.

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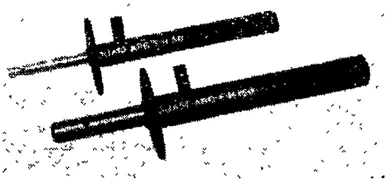
THE development of cellulose derivatives has been one of the main objectives of Courtaulds, Ltd., since 1905. The firm's wide experience in cellulose acetate materials has been neatly summarised in a booklet, " Cellulose Acetate Plastics," just published, which covers all stages from the raw material to the finished products.



[Courtesy of Quasi-Arc Co., Ltd.

Electrode holder, type EH. 50, for welding at currents up to 50 amps. Weight 5¼ oz.

NEW electrode holders for manipulation of the light gauge electrodes used in sheet metal welding have been designed by the Quasi-Arc Co., Ltd., Bilston, Staffordshire. The design embodies a spring loaded plunger which wedges the electrode in the brass barrel of the holder and can be easily released by a trigger. Electrodes may be gripped in either of two positions, making the holder satisfactory for positional as well as downhand welding. The smaller type EH.50 weighs 5¼ oz. and is designed for welding with 16 or 14 s.w.g. electrodes at currents up to 50 amperes. The larger type EH.150 weighs 12¾ oz and is for use with 16 to 10 s.w.g. electrodes at welding currents up to 150 amperes.

* * *

A REFINEMENT in present automatic process control apparatus is the multi-functional valve positioner described by Negretti and Zambra, Ltd., in its latest catalogue (R/29). The unit can be readily mounted on all sizes and types of diaphragm valves and level motors. It can be adapted to valves which close with air failure or open with air failure and is suitable for control line pressures of 15, 20 or 25 p.s.i. (output pressures up to 40 p.s.i.).

* * *

THE latest developments by some 124 German chemical engineering firms and a series of articles by leaders of science and technology form the first part of the "Achema Year Book," 1940/50. The volume of 704 pages is edited by Herbert Bretschneider on behalf of the Dechema, Deutsche Gesellschaft für Chemisches Apparatewesen E.V., and has many illustrations. The directory of manufacturers of laboratory equipment and works plant contains about 19,000 entries. The first part of the work is devoted to the discussions planned to take place at the Achema IX Exhibition (Frankfurt, July 9-16).

Accuracy of the Chemical Balance

In Advance of Most Laboratory Measurements

THE extent to which the chemical balance has outstripped most other measuring devices of the laboratory produces some anomalies in analytical and other techniques and represents incidentally a challenge to procure further refinements in other equipment. In most physical measurements in the laboratory an accuracy of ± 0.05 per cent is considered precise: in weighing 200 gm. some balances provide an accuracy of 0.00005 per cent (0.1 mg.).

High Accuracy

These facts are recalled in "The Nivoc Supplement" (W. & J. George & Becker, Ltd.) which calls attention to the fact that the great precision possible with the balance is often employed unnecessarily in physical determinations where other measurements cannot be made so accurately; but in chemical determinations, where small differences of weight have often to be measured, this high accuracy is essential.

The article, which emphasises how important is correct use to take advantage of the great precision now possible, also provides a useful basic summary of the theory and construction contributing to the high efficiency of balances.

It observes that the mathematical theory of the balance is dealt with fully in many textbooks. The main conclusion to be drawn is that a sensitive, consistently accurate and practical balance should have a light but strong beam, pointer and pan system; hard, sharp and non-corroding knife-edges arranged to lie exactly in one plane at all loadings of the balance; and suitable arrangements for protecting the sensitive parts of the balance when they are not in use.

Permissible Error

The accuracy of the balance when used in the normal single weighing method depends entirely on the two arms of the balance beam being exactly equal, *i.e.*, the distance from each outer knife-edge to the centre knife-edge must be identical. In the 200 gm. balances accurate to 0.1 mg., the maximum permissible error is one two-millionth of the length of the balance arm, a dimension which amounts to little more than one-millionth of an inch, or about one two-thousandth part of the thickness of a hair.

Further, the three knife-edges must be parallel to an equal degree, or the apparent weight of an object will be affected by the position in which it is placed on the balance pan. The consistency of the balance from weighing to weighing, and during its life, is highly important and depends upon choice of suitable material for the knife-edges and planes, which should be sharp and straight, and optically flat respectively.

The material from which the knife-edges and planes are made is a special hard grade agate. For some purposes steel is satisfactory, although rust is a constant menace, while synthetic sapphire (or corundum) is also used to a smaller extent. The knife-edges and planes need careful protection, and various types of "arrestment" are used to remove them from stress when weighing is not being performed.

This article considers that the best type is the "fall-away arrestment," in which supports are gradually withdrawn from the beam and pans until the knife-edges and planes are in contact.

Lightness of Beam

The sensitivity of the balance is determined entirely by the lightness of the beam and pointer system; by the distance the centre of gravity of this system lies below the central knife-edge; and by the length of the arm of the balance. Practical considerations limit the use of the latter two variables, and therefore it becomes essential to use a very light construction for the beam of a sensitive balance. Careful design is required to obtain a beam which does not deflect appreciably when fully loaded and which has its centre of gravity correctly located.

The period of swing is an important practical consideration, for a very sensitive balance may have all its other advantages offset by the inconvenience and tedium of having to wait 30 seconds or more for each observation of the pointer position. Other things being equal, a light balance beam is required for a short period, and this is another reason for the use of light materials and the method of construction of sensitive balance beams. Further, it is the reason for the use of short beam balances, since theoretically a long beam balance should give greater sensitivity.

OVERSEAS CHEMISTRY AND INDUSTRY

GERMAN EXPORT PROSPECTS

Plans to Recover Pre-War Status

A CRITICAL review of world chemical trade and of Germany's position therein is offered in the April issue of *Chemische Industrie* (pp. 151-168). It is recalled that, before the war, about 60 per cent of German export trade was carried on through overseas "partner" agreements. The present rather one-sided liberalism is criticised, on the grounds that Germany gives much in the way of lowered tariffs and receives little in return. The high import tariffs of the U.S.A. are particularised as a serious hindrance.

These German views emphasise that European export trade urgently needs a broader and freer entry into the markets of the American continent, Africa, and south-east Asia. Even countries supporting liberalism in trade are considered to have done so more in principle than in fact. While Germany has reduced or completely removed import duties from 44-60 per cent of her imports, many other countries have given relief only to the extent of about 25 per cent.

Concluding the review in which these factors are distinguished, W. E. Menne, president of the Arbeitsgem. Chem. Industrie, expresses some satisfaction that Germany's efforts to expand her export trade in recent months, especially in quality products, have met with some success.

In an article on West German chemical exports in 1949, Dr. K. Schneider observes that out of a total of about Dm.350 million ($95 million) 80 per cent went to Europe, 9 to America, 8.4 to Asia, 1.5 to Africa, and 1.1 per cent to Australia. Some details are given of the individual groups of exports, in which fertilisers took second place, valued at Dm. 14.2 million.

Exchange Reserves

The special problems of the wholesale and export trades in the chemical field are discussed by Hellmuth Carroux, president of the Verband des deutschen Chemikalien, etc. Important among these is the provision of imported raw materials by building up exchange reserves, some examples of which are the oils, fats and soap industries and the paint and varnish trades.

A thorough study of world markets is needed and the renewal of former contacts in various countries, a task which is claimed to be rather difficult because of restrictions and travel costs, A specialised organisation should examine, for a particular chemical group, foreign developments, market tendencies, and production conditions much more intimately than could an individual manufacturer.

The author makes particular reference to the needs of the pharmaceutical branch, with which he is closely connected, which constitutes one of the most important sections of his association. The necessary raw materials, mainly of plant origin, are spread over the world, and a profound knowledge of sources of supply, prices, quality, etc., could best be acquired by a trade and technical association. A further task is that of facilitating close collaboration at home and abroad between producers of raw materials and manufacturers of finished and semi-finished goods.

Sequestration

The Trade Mark Association (Markenverband e.V.) in Wiesbaden has recently presented a report to the West German government expressing the view that it is being recognised abroad that the sequestration and other restrictive steps taken against German trade mark rights have not always been in the best interests of the general public.

Dr. Erich Herzig refers to the part played by heavy chemicals in export trade and notes the inroads made in former German markets by the development abroad of domestic chemical industries. The productive capacity for heavy chemicals has been increased enormously in the U.S.A., England and France, and in a proportionate degree in other smaller countries. The high cost of imported raw materials, loss of patent and trade mark rights and other difficulties have weighed heavily. Despite these, however, exports of inorganic chemicals have made good progress, in particular, sulphuric acid, alkalis, sodium sulphate, aluminium fluoride, chromates and bichromates. Exports of potash, which had almost ceased in 1949, were recently resumed.

It is concluded, however, that there is an urgent need to increase substantially the range of chemical exports, if a favourable trade balance is to be restored.

Increasing Mineral Yields in Egypt

Recommendations for an Iron and Steel Industry

EGYPTIAN Government advisers have stated that reserves of iron ore in their country amount to at least 300 million tons, containing 45-50 per cent of iron oxide.

This information is reported by C. E. Butterworth, Assistant Canadian Government Trade Commissioner, in an article published in *Foreign Trade* (7, No. 173, 694-7).

H. A. Brassert & Company, the American consulting engineers, is said to have made a wide survey in Egypt and reported that the Egyptian market justifies the establishment of an iron and steel industry and can keep it in regular operation; the quality of the ore is excellent, easily reducible, and can be mined at low cost. Whether the works are at Aswan, using electrical smelting with a reduced amount of imported coke, or in Cairo, employing blast furnace smelting, the industry would give an adequate profit.

Some Government officials have proposed the exploitation of iron ore deposits along the Red Sea coast and that the ore should be transported to Suez, where a proposed plant could make use of local oil for smelting. This group maintains that the project at Aswan (some 800 miles from the Nile Delta) could be developed only to satisfy local needs, whereas a plant at Suez might compete in the world export market for steel.

Egypt has a variety of other mineral resources and, although increased interest in prospecting and mining is evident, the capital and organisation of enterprises is still supplied mainly by foreign sources. Discoveries in the past 15 years have led to the opening up of new areas and the growth of the industry is manifested in the steadily increasing revenue of the Department of Mines and Quarries, which recently reached £E.942,692 in a year, an increase of £E.878,963 above the 1933 revenue.

Additional reserves have been proven of phosphates, manganese, gold, iron ores, talc, chromite, graphite, tungsten and kaolin. In the metals group there are deposits of lead, zinc, molybdenum, copper, nickel, titanium, beryllium and thorium.

Deposits have also been established of limestone, marble, gypsum and anhydrites, building sand and clays, fuller's earth, asbestos, zircon, bentonite, barium and strontium.

The most important exports are phosphates, iron ore, manganese, talc and petroleum. Phosphate deposits are abundant and of good quality. Because of the high level of duties levied by the Suez Canal authorities, Egyptian phosphates have been unable to compete in the dollar markets; the Government of Egypt has been asked to subsidise the industry to make this possible. The commodity's best markets are stated to be Australia, New Zealand, South Africa, Ceylon and Japan.

Oil is, of course, Egypt's most valuable mineral deposit. Production of oil in 1948 was 1,890,595 metric tons. If the domestic demand of 46,000 barrels per day does not greatly increase, the country is believed to be in sight of self-sufficiency.

Mechanical Seals Agreement

FLEXIBOX, Ltd., manufacturers of mechanical seals, and Vokes (Canada), Ltd., a new subsidiary of Vokes, Ltd., the filtration specialists, have recently concluded an agreement for the sale and servicing of Flexibox mechanical seals in Canada. Vokes (Canada), Ltd., will act as agents for the entire range of Flexibox mechanical seals, which now embrace the following uses: oil refinery and chemical plant process pumps, refrigeration compressors, pumps handling food and pumps handling corrosive fluids such as some acids and alkalis.

Vokes (Canada), Ltd., is exhibiting at the Canadian International Trade Fair from May 29 to June 9 at Toronto, and Flexibox, Ltd., has taken part of the space for the display of its seals.

Standardised Electric Motors

CROMPTON PARKINSON, LTD., announces the development of a new range of a.c. motors, initially between 1 and 20 h.p., based on American and Canadian standards.

American and Canadian manufacturers have for some years had common standard frame sizes to make their motors interchangeable. The new Crompton Parkinson range will have standard American frames, but will be available with alternative horse-power ratings—one design for those markets requiring American standard dimensions and ratings, and another of identical dimensions but with greater horsepower for the British market.

This interchangeability will enable British manufacturers to meet the requirements of home and overseas markets.

SOUTH AFRICA'S MATERIAL SOURCES

Continued Expansion of Home Production

From Our CAPE TOWN CORRESPONDENT

THE chairman of the Industrial Development Corporation is heading a mission to the U.S.A. in connection with the scheme to make oil from coal. The mission's aims are mainly technical, but it is generally expected that American opinion will be sounded about the possibility of American financial participation in the organisation which is to be set up under the licence granted last year to the Anglo-Transvaal Consolidated Investment Corporation. It is possible that credits for the supply of plant may be arranged, rather than direct financial assistance to the semi-national company which is to handle the scheme. The original licence terms restricted the authorised capital of the concern to £13 million, but official statements now mention £15-20 million as the amount required to establish the industry. It is estimated that about one-third would be spent in the Union. The first of the coal-to-oil plants will be by the Vaal River in the O.F.S.

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MARINE Oil Refiners of Africa, Ltd., Simonstown, is making an improved marine drying oil for both general and specific purposes, vitamin A concentrates (by the Solexol process), low-potency vitamin A and D feed oils for human and animal consumption, and hardened marine oils. Up to 50 per cent of Maripol has been found suitable as a replacement for raw linseed oil in making putty. The high induction period in the drying of Maripol prevents hardening and skinning in bulk before use, and the durability of putty embodying such oils has been found equal to that of a linseed oil putty.

* * *

NEW products of Permoseal (Pty.), Ltd., Cape Town, are a fluid shellac gasket cement, a general jointing compound, and a water sealing compound. Production has been in progress for a few months and markets have been developed in neighbouring African territories. The local demand is also very much greater, as it is now difficult to obtain supplies of imported compounds. These items are being made to British formulæ and are of high quality. The jointing compound has passed a rigorous test from the South African Bureau of Standards, which worked on data supplied from Britain.

IN the current movement to increase the local manufacture of synthetic resins, it is pointed out that the import of raw materials, instead of the higher-priced end-products, could effect a considerable saving in foreign exchange. Part of these raw material needs could be obtained locally. It is believed that nearly all the additional plant and equipment required could be made locally; much of the plant and equipment now in use is South African made. The local synthetic resins are reported to have been well received by the nearby industries. Locally made products are considered preferable to those synthetic resins which polymerise fairly rapidly and cannot, in view of the financial risk, be conveyed by ship over long distances. The industry is concentrating initially on the production of synthetic resins for coating and adhesive purposes, but it is expected that the way will be opened for the later production of thermoplastic materials. There are many potential users and the Board of Trade and Industries has expressed itself in favour of the establishment of a local synthetic resin manufacturing industry which will contribute to the diversification of the Union's economic structure.

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PLASTICS and Allied Industries (Pty.), Ltd., are making vinyl chloride coatings of more than 30 different types, including coatings highly resistant to acids, alcohol, alkalis and other chemicals. They resist abrasion and thermal shock and retain integrity and bond for long periods. These coatings are being made in South Africa under licence from the Bakelite Corporation of the U.S.A.

* * *

ETHYL silicate is now being made in quantity by Silicon Chemicals (Pty.), Ltd., which is an associate of the Rely Paint and Metal Works, Ltd., in a large new factory at Klipfontein. This product is being sold locally for foundry applications and the manufacture of paints and for damp-proofing, water-proofing and the preservation of stone work.

* * *

THE rapidly developing Union Liquid Air Co. (Pty.), Ltd., Johannesburg, plans to increase its capital to £600,000. This company began operations in October 1949.

PERSONAL

Next President of the ACS

Dr. N. Howell Furman, Russell Wellman Moore Professor of Chemistry in Princeton University, New Jersey, has been chosen as president-elect of the American Chemical Society. The doctor, a leading analytical chemist, will hold office next year, when the society celebrates its diamond jubilee and when American chemists will be hosts to the 16th conference of the International Union of Chemistry and the 12th International Congress of Pure and Applied Chemistry.

The following officers will serve the industrial Pest Control Association during 1950: President, Dr. F. P. Coyne, Imperial Chemical Industries, Ltd.; vice-president, Mr. S. W. Hedgcock; hon. treasurer, Mr. C. Stuart Kregor. The secretary is Mr. W. A. Williams.

Dr. W. Albert Noyes, Jr., chairman of the department of chemistry in Rochester University, New York, has been appointed editor of the *Journal of the American Chemical Society.* He succeeds Dr. Arthur B. Lamb, of Harvard University, who retired after 31 years' service.

Four new members of the Textile Institute's council are: Mr. J. R. Healey (chairman of the Yorkshire section); Mr. J. C. H. Hurd (hon. secretary Midlands section); Mr. Geoffrey Loasby (chairman, South Wales and Monmouthshire section); and Mr. R. G. Oversby (hon. secretary, Yorkshire section).

Mr. F. G. Bevin, managing director of Crosfields and Calthrop, Ltd., Liverpool, and a director of other firms, has been elected president of the Liverpool branch, Incorporated Sales Managers' Association. Mr. Albert Bird, sales manager of the same company, has been appointed chairman of Liverpool branch ISMA.

Dr. Pauline Beery Mack, director of the Ellen H. Richards Institute and professor of household chemistry at Pennsylvania State College, has been chosen to receive the 1950 Francis P. Garvan Medal for women in chemistry. The award will be made at the 117th national spring meeting of the American Chemical Society.

Mr. William Flockton, of Sheffield, steel manufacturer, left £48,120.

Sir John Arthur Alton, C.B.E., of Duffield, Derbyshire, late governing director of Alton and Co., Ltd., pipework specialists and ironfounders, left £83,157.

EXPLOSION UNEXPLAINED

Inquiry into I.C.I. Fatalities

THE cause of the explosion at the Ardeer (Ayrshire) factory of I.C.I., Ltd., on April 4, which resulted in the death of four women workers, remains unexplained. At a public inquiry in the Kilmarnock Sheriff Court last week, James Campbell Hornel, deputy chief superintendent, stated that an inquiry held at the factory had revealed no definite cause of the explosion.

Mr. Hornel said he was employed in the blasting department, which included the power section in which were the hand cartridging houses. In these houses were two machines, at each of which two women were employed. There were no moving parts in the machines and all the operations were carried out by hand. That type of machine had been used at Ardeer for 30 years and there had been no previous accident.

The house in which the four women had been working had been completely destroyed. Mr. Hornel did not know of any safety device that had been neglected on the day of the accident.

French Chemists Welcomed

THE cordial relationship between industrial chemists here and their French counterparts was fully evidenced by the character of the welcome extended in many quarters last week to the president, M. Robert Bienaimé, and the large party of officers and members of the Société de Chimie Industrielle during their visit to this country.

The delegates were entertained continuously from the time of their arrival on Sunday evening (May 7) until their departure a week later by some of the principal chemical and allied undertakings and the Society of Chemical Industry. The latter—some 33 years ago—provided the example stimulating the enterprise by Paul Kestner and Jean Gérard to which the French society owes its existence.

In addition to the long series of social events provided for their entertainment, the French group took full advantage of a long programme of visits to industrial centres, research institutes and the British Industries Fair.

Artisone Imports

The Board of Trade reports that a licence is now required by United Kingdom importers of artisone and artisone acetate.

• HOME •

Temporary Duty Exemption

The Treasury has made an order exempting sodium antimonate from key industry duty for the period beginning May 13, 1950 and ending June 30, 1950.

Salford Refinery Fire

Fire which started in the pump-house of a fractionating plant of an oil refinery at Salford last week threatened 8 million gall. of petroleum in 50 tanks. Firemen fought the blaze for an hour.

Pharmaceutical Industry's Plans

The British pharmaceutical industry now has a productive capacity equivalent to £32 million a year, but it is planned to raise that to £56 million in the next year or two. This was recalled by Mr. J. Davidson Pratt, director of the ABCM, at the annual dinner, held recently in London, of the Association of British Pharmaceutical Industry.

Readers' Pensions Committee

At the annual dinner of the Readers' Pensions Committee, in London last week, it was announced that this year's appeal under the chairmanship of Mr. Glanvill Benn had already exceeded last year's total and it was hoped by the end of the year to reach the second highest total since the organisation was formed 62 years ago. During that time 53 pensions have been founded and pensions provided for about 300 members.

British Oxygen Factory Approved

A proposal by the British Oxygen Co., Ltd., to erect a factory to manufacture, compress and distribute industrial gases, on a 25-acre site between Carmyle and Mount Vernon, Glasgow, has been approved by the Lanarkshire County Council. The total floor area would be about 200,000 sq. ft., giving scope for employment of about 400 men. The company's other works in the Glasgow area will be transferred to the new site.

Fatal Works Explosion

Firemen and troops searching for two persons missing in the explosion and fire at the Ironbridge (Salop) Metal Works on May 13, found the body of Mr. F. Frankel, the firm's managing director. It was lying under a mass of bricks near the furnace-room wall. A woman employee, Mrs. Kate Healey, was still missing, and the search for her continued after dangerous walls had been shored up. The factory building was half demolished on May 12.

Oil Store Fire

A fire last week is reported to have destroyed a large store containing drums of oil at the premises of Ferguson and Menzies, oil refiners, Lawmoor Street, Glasgow.

BAC Summer Tour

A visit to Chamonix, Mont Blanc, from July 30 to August 14, is being arranged by the London Section of the British Association of Chemists. Non-members may join the trip on application to the hon. secretary, Mr. H. Warson, 22 Gunton Road, E.5.

New Water Pipe-line

The Tees Valley Water Board's £461,000 pumping scheme to provide water from the river at Low Worsall by direct pipe-line to the greatly enlarged works of I.C.I., Ltd., at Wilton, North Yorkshire, is expected to be ready for operation in August or early September, states the board's chairman.

Textile Institute Membership

The election of 40 new members of the Textile Institute, at its meeting on May 17, brought the total to over 5000. The increasing attention given to the interests of juniors and students was emphasised in the institute's recent annual report. Thirty per cent—236—of all the members elected in 1949 were junior and junior student members. At December 31 their membership exceeded 600.

Drum Manufacturers at Paris Fair

One of the largest British displays at the Paris Fair (May 13-29) will be that of the Van Leer organisation, which incorporates Metal Containers, Ltd. The fair coincides with the 30th anniversary of the group's foundation. To celebrate this Van Leer is erecting its own building to house a comprehensive range of its exhibits. A separate stand will show a self-powered mobile drum factory in operation, believed to be the first of its kind.

Fatal Accident Sequel

A fine of £15, and 13s. 6d. costs, was imposed at the Hamilton Sheriff Court last week on the Lanarkshire Steel Company, Flemington, Motherwell, which had pleaded guilty to a contravention of the Factories Act, 1937, by failing effectively to prevent overhead cranes from travelling within 20 ft. of workmen repairing the roof on December 7. A workman was fatally crushed.

◆ OVERSEAS ◆

E. German Pharmaceutical Products

The Chemical Works Schwaan, Mecklenburg (Soviet Zone) is to increase its production of liver extract products and of ergostetrine. The works are in close touch with the Jenapharm enterprise in Jena.

Dutch and Colonial Red Lead

A joint British-Dutch factory for the production of red lead is being put up at Hertogenbosch, Holland. A limited company under the style of Bourne Chemische Bedrijven N.V. will run the factory.

Dutch Chemicals Total

Total turnover of chemical industries in Holland in 1949 amounted to about G.782.5 million. Exports accounted for more than 226.25 million guilders. Pharmaceutical articles, pigments and printers' ink, soap and detergents, sulphuric acid and superphosphate were the outstanding items of the total production. The aggregate number of chemical factories in Holland in 1949 was 459, employing 29,240 workpeople.

Serum Factory in Ceylon

A scheme to establish a serum factory in the Uva province of Ceylon has been put forward by Dr. W. G. Wickremasinghe, director of medical and sanitary services, and has been approved by the Minister of Health, Mr. S. W. R. D. Bandaranaike. The project has met with some opposition on grounds that it would be uneconomic in view of the increased use of sulpha drugs. It is hoped, however, to export the serum to other countries in South East Asia.

New Canadian Oil Refinery

The Anglo-American Oil Co., Ltd., announces the construction by Imperial Oil, Ltd., of a new 10,000-barrels-a-day refinery at East St. Paul, Manitoba. This has been made possible by the pipe line now being laid from Edmonton to Lake Superior to provide crude oil from Alberta. The completion of the plant, which is costing $10 million, is scheduled for May, 1951. It will have Western Canada's first fluid catalytic cracking plant, which will produce high octane petrol. The refinery will also manufacture tractor distillate, stove oil, furnace oil and heavy industrial fuel. It has been designed so that additional refining facilities can be added as demand warrants.

Methane Gas from the Saar

Three plants to produce methane gas are to be installed in Saar mines this year. The first installation which came into service at the end of 1949 was at Neuenkirchen.

India Shellac Prices Fall

Small overseas demand, particularly from the U.S.A., has resulted in a sharp fall in the price of Indian shellac. The Indian Lac Committee has decided to spend some Rs.15,000 on publicity in the U.S.A.

New DDT Plant for Mysore

A new DDT factory and technical institute is to be started shortly in Mysore. DDT has already been put to very good use in the State's drive for food self-sufficiency. One district is reported to have been cleared of mosquitoes, thus enabling the State to bring an additional 4500 acres of land under the plough.

Cinchona Production

A Dutch-Belgian conference on the issue of cinchona production and processing into quinine salts will be held this month in Brussels. The attendance will include two representatives of Indonesia. The fact of this gathering denotes the importance the subject has acquired in the past few years, in which a factor has been the Congolese cultivation of cinchona bark.

New Rubber Source in Hungary

Hungary is reported to have acclimatised a new rubber plant, imported from Russia, the rootsap of which contains a latex-like substance. Last year's harvest is claimed to have provided a rubber having a ductility equal to that of the tropical product and greater hardness. Its elasticity and resistance to wear and tear is admitted to be inferior.

Australian Refining Progress

Crude oil from the Klamono field of Dutch New Ginea (THE CHEMICAL AGE, 62, 544) is now being refined in Australia, where the Vacuum Oil Company's plant at Altona, near Melbourne, recently started processing the first shipment of 15,000 tons. This development may enable the Commonwealth to save about $1 million annually and implements Vacuum's programme of refining more than one-half of the country's requirements of lubricating oils. The Altona plant is the only refinery in Australia which treats crude oil without preliminary blending or treatment.

The Stock and Chemical Markets

ALTHOUGH British Funds continued their rally, markets generally have remained cautious, particularly in the industrial section. These were affected by the many indications that, owing to higher railway freights and coal prices, etc., rising costs will this year reduce earnings of many companies unable to expand turnover.

Imperial Chemicals have eased further to 41s. 9d., although the full results for the past year's working and the impressive review covering all sections of I.C.I. activities, testify to the company's progressive policy.

The consolidated balance sheet of the company and 93 subsidiaries totals £203,031,956, compared with £191,949,218 at the end of 1948. Cash in hand, tax reserve certificates and holdings of British Government securities have declined from £12,744,103 to £4,298,777, but the excess of the company's current assets over current liabilities and provisions amounted to £23,921,610. On the other hand, commitments for capital expenditure total approximately £22 million. Trading profits of the group, including investment income, etc., were £27,172,116, compared with £31,171,207 in 1948. Tax was lower and consolidated income, less tax, was £10,826,681, against the previous year's £11,897,056, of which £9,791,503 (against £10,850,414) was applicable to the parent company.

Reserves receive £1.5 million, additional central obsolescence provision is £1.5 million and the dividend is again 10 per cent. A major factor explaining the lower earnings was contraction of selling prices abroad, particularly of the alkali and general chemicals division. This, coupled with increased costs, not at that time reflected in selling prices, caused the fall in trading profits, in spite of an increase in the total turnover from £164 million to £174.6 million.

In the industrial chemicals market, Monsanto Chemicals 5s. units strengthened to 48s., Fisons were 23s. 6d., Brotherton 19s. 3d. and F. W. Berk shares moved up to 15s. 6d. on the financial results. Dunlop Rubber eased to 61s. on the past year's figures, and Lever & Unilever, at 39s. 9d., easier, there being some doubts whether the Dutch Lever N.V. will be able to maintain its dividend. The 4s. units of the Distillers Co. were firmer at 17s. 6d., and United Molasses, at 42s. 6d., were firm.

Albright & Wilson were around 28s. 3d., Borax Consolidated 51s. 6d. and Glaxo Laboratories around 46s. 6d. British Glues were 19s. 9d., De La Rue steadier at 20s. 9d. and British Xylonite fluctuated rather sharply around 73s. 9d. Turner & Newall were active up to 81s., pending the interim dividend announcement, and Boots Drug were up to 48s.

Market Reports

GENERALLY firm conditions prevail in the industrial chemicals market, the movement to the home consuming industries continuing at a satisfactory level. Export trade is again reported to be on a steady scale and it is reasonable to assume that a certain amount of new business has developed as a result of the British Industries Fair. The fluctuations in non-ferrous metal prices continue and the recent upward movement in the price of lead has brought about three changes in a week in the convention quotations for white and red lead. The basis price for the former is now £123 10s. per ton and for dry red lead £114 5s. per ton. The zinc oxides are also dearer. With the approach of the peak seasonal period for tartaric acid and cream of tartar, the prices of both are slightly lower at 165s. per cwt. and 142s. per cwt., respectively.

MANCHESTER. — Advances in several sections of the Manchester chemical market, arising from the increase in transport costs and the consequent stiffening of prices of fuel and other raw materials, have been reported during the past week. Announcements are, however, still awaited in respect of the majority of products. Among the increases so far is that of one shilling a ton in all grades of sulphuric acid. Lead and zinc compounds are also dearer, chiefly in sympathy with movements in the metals. A fair home and export business has been reported during the past week in the leading heavy chemicals and also in most of the tar products.

GLASGOW.—The demand for chemicals in Scotland continues to increase and the volume of chemical business being transacted is probably higher than at any time in the past. There is at the moment a shortage of certain products as a result of the recent fire at a large chemical works. The coal tar products, which were already in short supply, being particularly affected. The shortage does not appear as yet to have caused any serious hold-ups among the consuming industries.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Chromocine, Ltd., London, W., chemical manufacturers, etc. (M., 20/5/50.) April 18, £7000 charge and debenture, to N. H. Dewhurst & Co., Ltd.; charged on 158/168 Kensal Road, W.10, undertaking and all property and assets (other than the freehold property) both present and future including the uncalled capital. £4000. July 12, 1950.

Diazapol Dye & Chemical Co., Ltd., Accrington. (M., 20/5/50.) April 13, charge to Halifax Building Society, securing £600 and further advances, charged on 297 Bury Road, Tottington. *Nil. Dec. 23, 1947.

Satisfaction

Lake, Orr & Co., Ltd., London, S.E., wax, paint manufacturers, etc. (M.S., 20/5/50.) Satisfaction April 21, of charge registered January 27, 1936.

Company News

The Dunlop Companies

The consolidated operating profit of the Dunlop group for 1949 was £9,480,850, as against £10,768,376 for 1948. The net profit, after tax, of the Dunlop Rubber Co., Ltd., was £2,947,390, as against £2,924,280 in 1948. A dividend of 12 per cent and a bonus of 3 per cent, less tax (same) on ordinary stock, is recommended.

Greef-Chemicals Holdings, Ltd.

The directors of Greef-Chemicals Holdings, Ltd., are recommending payment of a final dividend on the ordinary stock of 8¾ per cent and a bonus of 3½ per cent, less tax, making a total for 1949 of 12½ per cent plus the bonus. The profit for the group for the year ended December 31 was £62,741 (£73,461).

The International Nickel Co. of Canada, Ltd.

The net profit of the International Nickel Company of Canada, Ltd., for the quarter ended March 31, 1950, was (U.S.) $8,329,015, equivalent, after preferred dividends, to 54 cents per share on the common stock. Net sales in the first quarter of this year of $47,392,082 compared with $44,895,721 in the previous quarter and $55,624,831 in the corresponding period of 1949.

Montecatini Results

The Montecatini company, of Milan, Italy, reports a net profit for 1949 of lire 3873.7 million (lire 3175.7 million in 1948). An unchanged net dividend of 12 per cent is being paid on the increased share capital of lire 30 million (lire 24 million in 1948).

Increases of Capital

The following increases in registered capital have been announced:—Allied Colloids (Bradford), Ltd., from £20,000 to £40,000; Cleckheaton Chemical Co., Ltd., from £35,000 to £61,000; Clayton & Jowett, Ltd., from £40,000 to £65,000; Dextran, Ltd., from £5000 to £30,000; A. Ibbetson & Co., Ltd., from £100 to £20,000; Headman & Holden, Ltd., from £150,000 to £300,000; John Harley, Ltd., from £5000 to £100,000; Highline Products, Ltd., from £3000 to £10,000; Lincolnshire Chemical Co., Ltd., from £15,000 to £30,000.

The capital of Metallo Chemical Trust, Ltd., (which has become a public company) has been increased by £270,000 by the issue of 6 per cent preference, 5 per cent preferred and unclassified shares beyond the registered capital of £130,000.

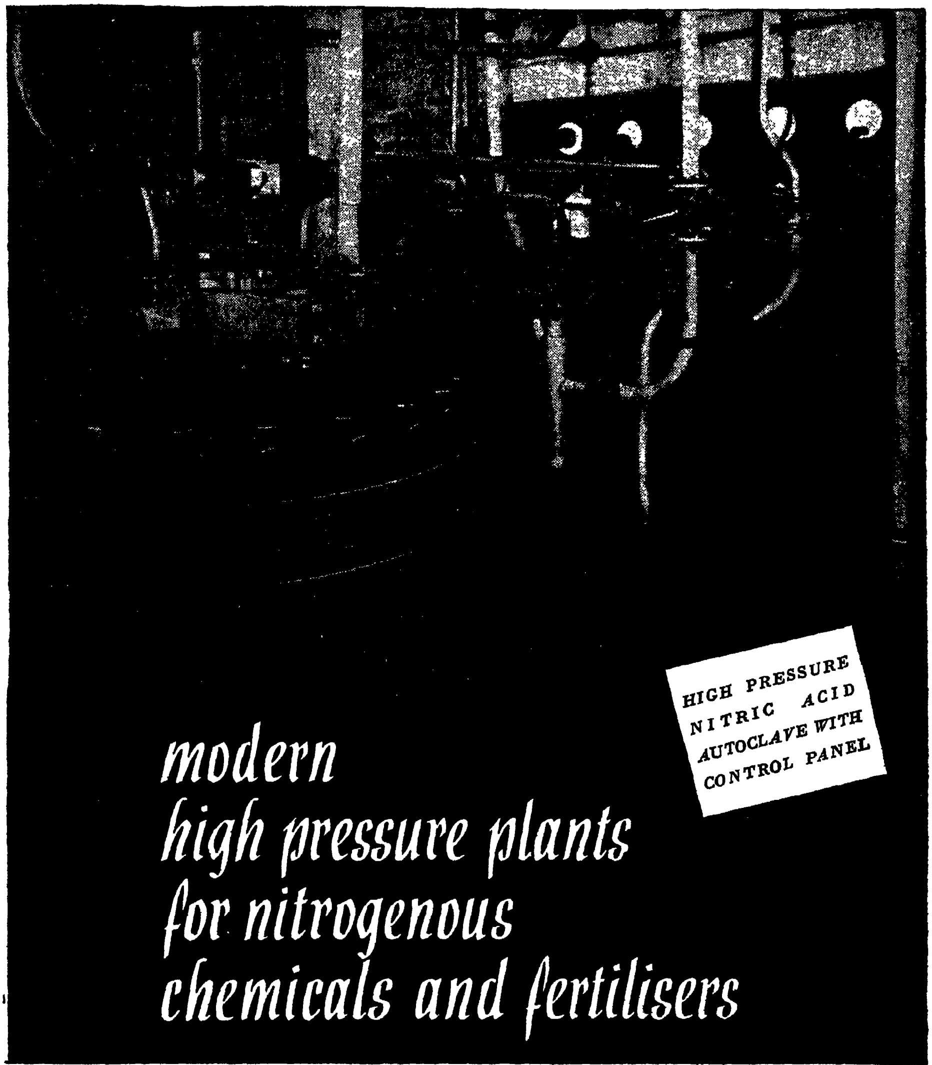
New Registrations

Hughes' P.3 Detergents, Ltd.

Private company. (481,795). Capital £100. Directors: M. D. Hughes and D. G. Higgs. Reg. office: 67 Moorgate, E.C.2.

Universal Crop Protection, Ltd.

Private company. (481,870.) Capital £10,000. Manufacturers of insecticides, fungicides, weedkillers, fertilisers and all chemical and other products for agricultural purposes; to undertake operations in any part of the world relating to the protection of crops, etc. Reg. office: Baltic House, 27 Leadenhall Street, E.C.3.



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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2 at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Method for joining non-metallic thermoplastic materials.—Udylite Corporation. Aug. 7, 1947. 637,881.

Alloy steels.—Birmingham Small Arms Co., Ltd., and G. T. Harris. Dec. 9, 1948. 638,110.

Production of sintered bodies from metal powders.—D. Primavesi. Dec. 29, 1947. 638,114.

Process for the production of vinylidenechloride.—Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. Jan. 27, 1948. 638,117.

Manufacture of biguanide derivatives.—Imperial Chemical Industries, Ltd., S. Birtwell and F. L. Rose, and M. R. Curd (legal representative of F. H. S. Curd (deceased)). Jan. 5, 1949. 637,892.

Compositions comprising polymeric materials.—Imperial Chemical Industries, Ltd., D. H. Coffey, O. B. Edgar, T. J. Meyrick, and J. T. Watts. Jan. 28, 1949. 638,118.

Preparation of dialkyl-substituted dihalogenosilanes.—British Thomson-Houston Co., Ltd. Feb. 25, 1948. 637,941.

Production of α β-dimethylenesuccinonitrile.—United States Rubber Co. March 24, 1948. 637,902.

Preparation of hydroxy aromatic carboxylic acids.—Ilford, Ltd., and D. J. Fry. May 9, 1949. 638,196.

Thermoplastic materials.—Compagnie Générale d'Electricité. Nov. 21 1945. 638,742.

Manufacture of acaricidal and disinfectant compositions.—R. M. Hughes. (J. R. Geigy A.G.). July 24 1947. 638,662.

Recovery of antibiotic substances.—Ayerst, McKenna & Harrison, Ltd. Aug. 27 1946. 638,664.

Adsorption process and apparatus.—Union Oil Co. of California. Sept. 24 1946. 638,745.

Process and apparatus for pelleting dry, flocculent carbon black.—Phillips Petroleum Co. Nov. 19 1946. 638,863.

Manufacture of drying oil substitutes or extenders.—Lobitos Oilfields, Ltd., M. Ingram, and D. H. Tullis. March 9 1948. 638,750.

Electrodeposition of nickel from an acid bath.—Udylite Corporation. April 19 1947. 638,867.

Process of preparing acetoxymethyl salicylate and acetoxyethyl salicylate and of preparing 4-keto-1, 3-benzodioxane, and 2-methyl-4-keto-1, 3-benzodioxane therefrom.—Monsanto Chemical Co. May 7 1947. 638,556.

Synthesis of primary alcohols.—E. I. Du Pont de Nemours & Co., and W. F. Gresham. May 16 1947. 638,754.

Conversion of fluid reactants in the presence of subdivided solid catalyst particles.—Universal Oil Products Co. June 17 1947. 638,873.

Detergent composition.—Procter & Gamble Co. June 17 1947. 638,637.

Process of and apparatus for obtaining finely divided precipitates.—Solvay & Cie. July 1 1947. 638,564.

Process for the manufacture of aromatic mercury compounds which contain mercury connected to the nucleus.—Spolek Pro Chemickou a Hutni Vyrobu, Narodni Podnik. July 8 1947. 638,565.

Process for the emulsion polymerisation of polymerisable substances.—N.V. De Bataafsche Petroleum Maatschappij. July 16 1947. 638,640.

Plasticised vinyl halide compositions.—B. F. Goodrich Co. July 17 1947. 638,567.

Plasticised vinyl polymers and process of plasticising same.—B. F. Goodrich Co. July 22 1947. 638,570.

Pearl polymerisation of vinyl compounds. —W. P. Hohenstein. July 30 1947. 638,572.

Manufacture of carbon bisulphide.—Hardman & Holden, Ltd., and H. S. Land. Aug. 28 1948. 638,676.

Production of protective phosphate coatings on metal surfaces.—Westinghouse Electric International Co. Sept. 26 1947. 638,889.

Insecticidal compositions.—R. C. Noyes. (Hercules Powder Co.). Sept. 30 1947. 638,678.

Liquid polysiloxanes.—British Thomson-Houston, Co., Ltd. Oct. 8 1947. 638,586.

Method of purifying zinc electrolytes.—Hudson Bay Mining & Smelting Co., Ltd. Oct. 14 1947. 638,651.

Ceramic dielectric materials and methods of manufacturing the same.—C. E. Every. (Titanium Alloy Manufacturing Co.). Oct. 17 1947. 638,834.

Bituminous compositions.—Shell Refining & Marketing Co., Ltd., and P. J. Garner. Oct. 13 1948. 638,654.

Process for the preparation of esters.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 28 1947. 638,763.

Apparatus adapted for use in pH determination.—Muirhead & Co., Ltd., and E. W. Tucker. Oct. 5 1948. 638,718.

Reduction of gases rich in carbon dioxide.—Stord Kopparbergs Bergslags A/B. Dec. 23 1947. 638,719.

Cyclic acetals.—E. I. Du Pont de Nemours & Co. Dec. 23 1947. 638,895.

Processes of preparing antihistaminic compositions and the compositions resulting from said processes.—G. D. Searle & Co. Jan. 22 1948. 638,606.

Apparatus for collecting predetermined quantities of gas.—Gas Light & Coke Co., and L. Silver. Jan. 11 1949. 638,608.

Manufacture of biguanide derivatives.—I.C.I., Ltd., S. Birtwell, and F. L. Rose, and M. R. Curd. [Legal representative of F. H. S. Curd (deceased)]. Jan. 5 1949. 638,695.

Process for production of carbon monoxide.—Power-Gas Corporation, Ltd., and K. Ruschin. Jan. 29 1949. 638,769.

Manufacture of flux-coated aluminium welding electrodes.—Murex Welding Processes, Ltd., and E. C. Rollason. March 30 1949. 638,731.

Zinc casting alloys.—British Thomson-Houston Co., Ltd. April 9 1948. 638,733.

Absorptiometer.—I.C.I., Ltd., and R. P. Kinsey. May 26 1949. 638,740.

Manufacture of metallic titanium.—British Aluminium Co., Ltd., and L. Saunders. July 4 1949. 638,840.

Treatment of carbon to render it more active.—Hardman & Holden, Ltd., and H. S. Land. Aug. 28 1948. 638,700.

Adhesives for bonding plasticised polyvinyl halide-containing resins and articles bonded thereby.—G. L. Martin Co. May 24 1945. 639,185.

Purification of aluminium and magnesium.—National Smelting Co. July 25 1946. 638,904.

Treating magnesium bearing brines.—W. W. Triggs. (Dorr Co.). Oct. 4 1946. 639,123.

Diazo-type papers containing an alginate sizing.—General Aniline & Film Corporation. Dec. 2 1946. 638,908.

Culture media for the propagation of vegetative organisms. A Dinsley. Dec. 3 1947. 638,987.

Electrostatic treating process.—H. C. Lord, T. Lord, and B. M. H. Lord [trading as L.L.H. Co..]. Dec. 6 1946. 639,046.

Annealing of glass.—Pittsburgh Corning Corporation. Jan. 6 1947. 639,049.

Process for dewaxing mineral oils.—N.V. De Bataafsche Petroleum Maatschappij. Jan. 30 1947. 639,128.

Production of sheets of polymeric resin.—I.C.I., Ltd., and A. L. L. Tompsett. Feb. 13 1948. 639,199.

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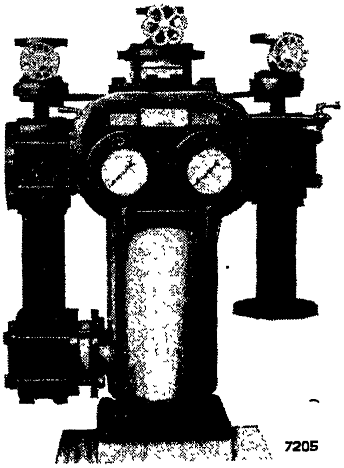

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SITUATIONS VACANT

THE Civil Service Commissioners invite applications for permanent appointments as **ASSISTANT EXPERIMENTAL OFFICER,** to be filled by competitive interview during 1950. Interviews will be held throughout the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced either for the competition as a whole or in one or more subjects. Successful candidates may expect early appointments.

The posts are in various Government Departments and cover a wide variety of Scientific (including Engineering) qualifications. Places of work are spread throughout Great Britain.

Candidates must be at least 17½ years and under 26 years of age (or under 31 for established Civil Servants of the Assistant (Scientific) Class) on 1st August, 1950; time spent on a regular engagement in H.M. Forces may be deducted from actual age. Candidates must have obtained the Higher School Certificate with Mathematics or a Science subject as a principal subject, or an equivalent qualification; but candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. Higher qualifications will be regarded as an advantage to candidates over the age of 20.

The inclusive London salary scale (men) is £230-£490. Salaries for women and for posts in the Provinces are somewhat lower. Superannuation provision is made under the Superannuation Act.

Further particulars and forms of application from the **Secretary, Civil Service Commission, Scientific Branch, 7th Floor, Trinidad House, Old Burlington Street, London, W.1,** quoting No. 3068. Completed application forms should be returned as soon as possible.
6742/250/DVL.

THE Civil Service Commissioners invite applications for appointments as **SENIOR SCIENTIFIC OFFICER** and **SCIENTIFIC OFFICER,** to be filled by competitive interview during 1950. Interviews began in January and will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced. Successful candidates may be appointed immediately. The posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of Fundamental and Applied Science. Candidates must have obtained a University Degree in a Scientific subject (including Engineering) or in Mathematics, with First or Second-class Honours, or an equivalent qualification, or possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' Post-Graduate or other approved experience. Candidates for Scientific Officer posts taking their degrees in 1950 may be admitted to compete before the result of their Degree examination is known.

Age limits: For Senior Scientific Officers, at least 26 and under 31 on 1st August, 1950; for Scientific Officers, at least 21 and under 28 (or under 31 for established Civil Servants of the Experimental Officer Class) on 1st August, 1950.

Salary scales for men in London: Senior Scientific Officers, £700 by £25 to £900; Scientific Officers, £400 by £25 to £650. Rates for women are somewhat lower.

Further particulars from **The Secretary, Civil Service Commission (Scientific Branch), 7th Floor, Trinidad House, Old Burlington Street, London, W.1,** quoting No. 2887.
4993/200.

The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Volume LXII 27 May 1950 Number 1611

Co-operation for Safety

THE contribution of some original and stimulating views at the recent national Industrial Safety Conference by one of the prominent personalities of the trade union movement must have recalled to many of the delegates at Scarborough how little practical interest is generally displayed by workers' organisations in this work of—literally—vital importance. At the Royal Society for the Prevention of Accidents conference, Miss Florence Hancock, a former chairman of the TUC, was concerned more to safeguard amenity, especially of women operatives, than with safety alone. The two objectives, however, are well recognised to be closely related, and this trade union contribution encourages hope of collaboration of which there is great need at the moment.

What should be the attitude of a trade union to safety matters? Any association (of dukes or dustmen) exists, or should exist, primarily for the good of its members. It may have quite a few other claims—even perhaps that it works for the common good of man, but those aspirations are not often its prime objective. The fact that the legal department of a trade union has succeeded in winning a Common Law action for negligence, procuring for one of its members £x as substantial damages for negligence is often used as a bait to increase membership. That form of protection is no doubt a useful service, but it tends to obscure the fact that compensation is little solace to a man or woman who has been permanently disfigured or whose health has been permanently affected. One can imagine the feelings of a man who has for the rest of his working life to accept as an *ex gratia* payment from employers, who may have been able to prove he was guilty of contributory negligence, the rate of pay for the higher rated job he was doing before his accident, although he can no longer carry out the duties of the bigger job.

There is no doubt that employers generally are coming to have a much livelier appreciation of the risks attending the operations carried out in their factories and are very ready to provide measures to minimise those risks. Where such protection has to take the form of protective goggles and clothing, there is, by contrast, a very marked reluctance on the part of the operatives to wear them, or to wear them in the proper manner. The purpose of a pair of goggles is to protect the eyes, yet it still serves very often as a decoration of the peak of the cap. It seems quite illogical that

On Other Pages

Leader:

Co-operation for Safety . . 771

Notes and Comments:

Steel Performance Vindicated . . 773
April's Trade . . 773
Experimental Gasification . . 773
Paper Education . . 774
Rust and the Iron Curtain . . 774
Awards to Metallurgists . . 774
Underground Gasification . . 775
Chemical Traders Deplore Controls . 776
Leather Chemistry . . 777
Promoting Safety in Industry . . 778
Parliamentary Topics . . 778
Chemical Exports in April . . 779
Electronic Polarometer . . 780
Improved Freeze Drying . . 780
Paint Companies' Merger . . 780
I.C.I. Research Activities . . 781
Shrink-Proofing of Woollen Fabrics . 783
Minor Elements as Fertilisers . . 786
The Diallyl Cyanamides . . 787
The Chemist's Bookshelf . . 788
Technical Publications . . 789
German and Spanish Developments . 790
Prices of British Chemical Products . 796

(The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

a man will cheerfully wear glasses at the behest of the local optician but will cavil at wearing a pair of goggles with plain glass windows to protect him against a very obvious risk. Logic seems unfortunately to have very little weight in such affairs.

How far this "resistance movement" could be due to a form of fatalism is exemplified by the following instance which occurred a good many years ago, but which has its parallels today. A young man, fresh from school, was being shown how to roll leather. The chargeman told him that he would never be able to consider himself a good rollerman until he had had his fingers trapped in a machine. The chargeman was, incidentally, the senior first-aid man of the factory and an operative of a very good type. What is more, every man on those machines had been trapped at some time and they all firmly believed it to be the inescapable lot of all who did that kind of work. Such a belief was installed into each boy at the start. It is to be hoped that there has been some eradication of that philosophy in the passage of years. It was a wicked doctrine, which almost certainly intensified proneness to accidents.

Probably the biggest obstacle to industrial safety is the operative, nearly ready for retirement, who is likely to observe that he "has worked man and boy for 55 years in this factory, never worn any (adjectival) gloves, and never been burnt." It is that sort of idle boast, common and harmless in its intention, which often serves to dissuade younger men from taking advantage of the protection provided.

Trade unions can help in the work by encouraging the use of protective devices and by giving their support to the doctrine that an efficient operative takes every care to safeguard himself. Certain unions insist that their members have undergone some form of training, and it seems only reasonable that any such training should include some practice in the use of protective equipment. In some firms, all new entrants have an interview with a member of the safety and welfare staff before starting work. During this meeting safety procedures are often discussed. Is there any reason why the man's union representative should not be present to support the welfare officer in that work? If ever there was an opportunity for real joint consultation, it is in this field.

Notes and Comments

Steel Performance Vindicated

THE ultimate vindication of the steel industry's capacity to supply what the country needs without Government ownership or even supervision of the distribution of its products was seen this week in the decision, announced almost casually in the House of Commons, that State allocation of nearly all classes of steel is ended. Judging by the number of Parliamentary questions in recent months designed to expedite that decision, steel might well have been removed earlier from the category of rationed commodities, where it has remained since the beginning of the war. The Supply Ministry could not fairly defer the freeing of steel much longer in the face of the repeated evidences of the industry's capacity to produce in almost every period substantially more than even the Government planners could anticipate. With the further increase of over 280,000 tons in four months this year, the prospect that a record total of around 16 million tons of steel will be attained in 1950 seems reasonably assured. One result of the continuous improvement of the supply position has been the cessation of complaints of material shortages by makers of chemical plant. They, however, will benefit less than some other industries because one of the forms of steel—certain pipes and tubes, sheet and tinplate—being retained for the time being under the allocation system, is a type they require. The freeing of these remaining hostages should be the next objective by the campaign for liquidating the beleaguered garrison of controls which have outlived their usefulness.

April's Trade

THE fact that the level of chemical exports last month conspicuously failed to preserve the high level of the March returns seems to have come as a direct confirmation of the forecasts made in the recent report of I.C.I., Ltd., that there would be some substantial difficulties in maintaining the high turnover in foreign markets. No firm trend in either direction, however, can safely be discerned on the evidence of one month's figures alone, and when the April total of £7,128,152 is compared with its predecessor in 1949 (£6.89 million) and with the February total this year of £6.85 million it is clear that the reduction of £1.14 million between March and April was no more than the expected reaction from the abnormal level attained in March. Total imports in the chemical group, representing a value of £2,626,423, cost more than in March or in April last year, but this was not a true indication of the increase in material costs, foreseen by I.C.I., since bulk purchases of chemicals as well as of true raw materials were in many cases larger last month. Representative examples of this expansion of raw material intake were crude petroleum, of which some 205 million gallons were purchased at a cost of £6.2 million, and oils and oilseeds.

Experimental Gasification

THE first attempt in Great Britain to prove the practicability of making use of part of the thermal value of coal without mining it has appeared to some watching the first underground gasification experiment at Newman Spinney near Sheffield this week as a rather belated consummation. Apart from the modern attractiveness of exploiting coal deposits in this way, in view of the economic difficulties of normal coal raising which have lately closed some Scottish pits, the theoretical advantages have been recognised by increasing numbers since Victorian times. The theory, which first results from the Derbyshire experiment may soon substantiate, was later described in some detail by Sir William Ramsay in 1912. The delivered price of coal then was approximately what is now charged for its delivery alone and the imperative need for cheaper sources of energy had none of its present urgency. That need would appear, however, to have received earlier recognition in Italy, Belgium and the U.S.A., and reputedly in the U.S.S.R., as early as 1938. A feature which appears to have been common to all these experiments, however, has been the paucity of evidence of their development on a substantial industrial scale. Even the Alabama project (THE CHEMICAL AGE, *56*, 344, *60*, 264, etc.) which was seen by some as being ultimately a possible source of "unlimited quantities of liquid fuel" seems signally to have failed to make headline news since then. None of this negative evidence has, of course, much bearing upon what may be the final significance of the first gas recordings at Newman Spinney. The low calorific value of any gas won by these methods has no doubt been the common deterrent. It remains to be seen now if the new versatility claimed for the gas turbine can provide the answer.

Paper Education

THE excellence of some journals issued by business organisations—house organs, as they are rather inadequately called—is a comparatively modern phenomenon of which new examples are increasingly frequent. Their high quality of production and presentation deserves admiration and the editorial contents are often technically important. The arrival last week of a new journal (it is almost a book) which embodies all those attributes was therefore welcome. "The Bowater Papers" states that its pages will not primarily be about the Bowater Paper Corporation but will be concerned with the history, art, science and literature of paper making and paper use. That claim is substantiated by the diversity of the articles contained in the first issue; one describes the laboratory testing of newsprint and of the raw materials with which it is made. One of the functions of the pulp-testing laboratory, the carrying out of the *p*H test on the backwater from the paper machines, is explained. The chemical and dye solutions and the testing of china clay slurries are also undertaken in the laboratory. Photographs show the wide variety of instruments used in the paper-testing laboratory to determine weight, substance, tensile strength and other physical properties. The whole gives a memorable impression of the highly developed laboratory services upon which the first requirement of most of the information services—newsprint—depends.

Rust and the Iron Curtain

JENOLITE, Ltd., calling attention to the fact that its rust removing and metal treating products are now represented by companies or agencies throughout the world, observes that substantially the only exceptions are countries "behind the Iron Curtain." "If that great barrier were not just a figment of fear and fiction, but a tangibile reality," adds Jenolite, "we would no doubt have been called in long ago to treat it and keep the rust off."

Awards to Metallurgists

THE Capper Pass Awards for 1949 have been made by the adjudicating committee on behalf of the councils of the Institution of Mining and Metallurgy and of the Institute of Metals to: Jean Matter and Marcel Lamourdedieu (Société Centrale des Alliages Légers, Issoire (Puy-de-Dôme), France); G. Chad Norris (West African Gold Corporation, Ltd.); Dr. E. Scheuer (International Alloys, Ltd., Aylesbury, Bucks.); H. L. Talbot (Anglo-American Corporation of South Africa, Ltd.) and H. N. Hepker (Central Research Laboratory, N'Kana, Northern Rhodesia). The last two received jointly £50 for a paper of "Investigations on the Production of Electrolytic Cobalt from a Copper-Cobalt Flotation Concentrate."

These awards, which are made annually from a sum of £200 given by Capper Pass & Son, Ltd., Bristol, are £100 per annum for one or more awards to authors of papers on some aspect of non-ferrous extraction metallurgy; £100 per annum for one or more awards to authors of papers relating to some process or plant used in the fabrication of non-ferrous metals, contributed by persons engaged full time in industrial practice.

UNDERGROUND GASIFICATION

Slow Start of the First U.K. Experiment

THE first practical experience in this country of underground gasification of coal, at Newman Spinney, some ten miles from Sheffield, on Monday, has not yielded conclusive evidence that it will be possible to profit by this method from the vast deposits of low-grade or inaccessible coal which is known to exist.

Six thermite bombs and their initial igniter charges of coal were fired electrically shortly after 2 p.m. and substantial emission of smoke and gas started. No measurement was made, however, of the constitution of what was emitted and the one critical recording, of the temperature of the gases, indicated that the heat value was very low. During the two hours that the progress was watched, there was no evidence that a high rate of combustion had been reached and experts were unwilling to affirm definitely that the coal seam itself had ignited. There was reason to believe that the water content was high in the neighbourhood of the seam, which could have delayed combustion and explained the low temperatures. On Tuesday is was concluded the experiment had not succeeded and more incendiaries were inserted. It was found possible to ignite the gas then emitted and samples are now being tested.

Of the much wider implications, such as the suitability of the gases to provide fuels, the present tests do not, of course, provide any evidence.

Full Collaboration

The outstanding characteristic of the work of which this was the culmination, has been the full co-operation that has been secured between industrial groups and Government departments. In collaboration with the Ministry of Fuel and Power as advisers or participants are the NCB, the Gas Research Board, Imperial Chemical Industries, Ltd., the Anglo-Iranian Oil Co., Ltd., Shell Petroleum Co., Ltd., the Fuel Research Station, the Atomic Energy Research Station, British Coal Utilisation Research Association and a number of other Government agencies. Duplicating to some extent the work at Newman Spinney are laboratory tests being carried out at the Fuel Research Station. There large blocks of coal have been drilled to create miniature gasification systems and preliminary results have been obtained. Those tests are proceeding.

The Ministry of Fuel records that serious drilling started at Newman Spinney in December. A series of (fire precaution) barrier holes was drilled about 200 ft. back from the exposed face (High Wall). Location holes were also drilled at 250 ft., 300 ft. and 350 ft. on the estimated line of the horizontal to locate precisely the position of the horizontal before drilling the operational and drainage holes to intersect it.

The total length of the horizontal borehole had to exceed 300 ft. Some 50 ft. at least, towards its far end, was required to be in the coal seam and preferably in the coal itself. Limited experience was available of drilling near the horizontal and virtually none in guiding a drilling bit to remain in a leaf of coal. Even if the bit followed a straight line and if the seam dip were consistent and accurately known, the maximum allowable error was less than 1°.

Controlled Drilling

In early March, after drilling six abortive holes, a seventh " horizontal " was drilled to nearly 400 ft., which showed promise of being useful. The borehole, as finally established, was in a 6-in. coal band from 240 to 247 ft., and in the lower leaf from 260 ft. to 280 ft. It was decided to make intersections by drilling the vertical operational holes at 240 ft. and 290 ft., leaving the whole length of the reaction zone between these points below the main upper leaf.

The next problem was to drill the two operational verticals and the drainage hole so as to intersect the horizontal at the desired points. The precision required is beyond the limits of ordinary survey under the conditions imposed by the site. Two new techniques were developed, which, it is now observed, may have application in other connections (*e.g*, methane drainage).

The Post Office Research Branch produced an electro-magnetic device, the magnet element of which could be inserted along the 4-in. horizontal borehole. A compass element is lowered down an adjacent vertical and, by impulse repeated to the surface instruments, the relative distance and direction of the two elements can be determined. For greater accuracy a repeater compass was made available by the Admiralty, but this required a 7½-in.

(continued at foot of next page)

Chemical Traders Deplore Controls

The Need for Freedom in Commerce

AN appeal for greater freedom from controls in order that the old spirit of adventure might once again serve commerce and industry, was the keynote of the speeches at the annual luncheon of the British Chemical and Dyestuffs Traders' Association, in London last week.

A gracious message from the King, in response to the association's greetings, was announced by the chairman, Brigadier C. Norton Stafford, C.B.E., T.D.

Proposing the toast of the association, Sir Herbert Williams, M.P., in an amusing speech recalled the old jibe that "manufacturers make goods, but merchants make money." He emphasised that British trade had, in fact, been built up through the initiatve and enterprise of the merchants.

Asking Permission

The trader to-day was overwhelmed by restrictions and controls. Why should anyone have to ask for permission before he could buy or sell anything?

The trader was the buffer between the producer and consumer. It was his duty to the whole productive industry to tell the producer if there was anything wrong with his products.

They, as a trading association, he said, were too modest about their achievements. People did not know of their activities—they should be told more.

The president, Mr. G. S. Bache, replying, referred to his difficult task in following Mr. Victor Blagden, who for some 25 years had done so much good work for the association.

It would not be long, he hoped, before there would be a clean sweep of the numerous Orders in Council by which they were inundated, and a chance for the association to use its own initiative to expand the great potential volume of export trade.

He referred briefly to the protest sent by the association to the President of the Board of Trade in connection with the report on the chemical industry for which he had called.

"The Guests" was proposed by Brigadier C. Norton Stafford, the chairman, who read a message of regret for his absence from Mr. Victor Blagden, at present on a visit to the U.S.A.

In response, Sir Frank Nixon, K.C.M.G., C.B., president of the London Chamber of Commerce, said that the chamber was happy to range itself among the battalions fighting for freedom from Government control.

The merchant adventurers of 150 years ago, who laid the foundations of British trade, had never heard of a "sterling gap." It was no good their saying "we'll sell you this but we want paying in convertible currency." They had to use their initiative to buy also, and so make London into a great centre of trade. America must learn that she must buy as well as sell.

Bulk Buying

All the efforts of the OEEC for liberalisation of trade in Europe would remain unavailing so long as bulk buying and controls remained in this country. Free markets and free currency went together.

Among those present were: Mr. C. W. Lovegrove (vice-president); Sir Harry Jephcott (ABCM); Dr. G. W. Bennett (Government chemist); Mr. G. H. Ward (Canadian Chamber of Commerce); Mr. C. E. Kihlstedt (Swedish Chamber of Commerce); Mr. J. A. Devine (Board of Trade); Mr. E. Mackenzie Hay (president, British Federation of Commodity Associations); Mr. C. Lord (president, Association of Tar Distillers) and Major T. Knowles (director, Association of Tar Distillers).

UNDERGROUND GASIFICATION

(continued from previous page)

diameter vertical hole, whereas the P.O. compass can be used in one of 4-in. diameter.

The Anglo-Iranian Oil Company (engineering research branch) developed radioactive means for location. For maximum range, some cobalt isotope of maximum safe intensity was produced by Harwell. This was inserted along the horizontal and a Sonde lowered down the verticals, giving surface readings for calculation of the distance and direction of the isotope.

Both systems worked satisfactorily and provided locations to within a few inches with close agreement. It is too early to give a final assessment of merit of the two techniques.

LEATHER CHEMISTRY

Increased Scope of the New Laboratories

THE theme that Britain's great activity and success in scientific research must in future be matched by an equal readiness to apply the results to industries, was stressed by Sir Ben Lockspeiser, secretary of the Department of Scientific and Industrial Research, in an address at the official opening—performed by H.R.H. the Duchess of Kent—on May 22, of the new laboratories of the British Leather Manufacturers' Research Association, at Milton Park, Egham, Surrey.

It was not sufficient in any trade to have only craftsmanship. We must do as some other nations were learning to do—supplement craftsmanship with science. It was easy to apply science in an industry born in the laboratory, like rayon manufacture, but in craft industries, such as textiles and leather, it was very different; the materials were not uniform and the chemistry extremely complex. Experience had shown, however, that sooner or later the scientific approach would supersede empiricism.

As regards leather chemistry, they now had sufficient knowledge to justify the belief that big advances might soon be expected in the manufacturing processes.

A Press tour of inspection of the new laboratories, on Monday, revealed that these occupied some 15,000 sq. ft., comprising 50 rooms, and that the very much increased space, as compared with the old Nelson Square, London, S.E.1, premises, would give the association greater facilities generally, but would be used particularly for the development of the chemical engineering side of the industry. Problems in the engineering sphere which the association had been called upon to resolve had previously had to be put out to firms in the trade and engineering establishments having the special facilities.

Current Work

Open days were held at the laboratories on May 23, 24 and 25, when exhibits staged for visitors included a number of items connected with the biochemistry of hides and skins. In this section of the laboratories was shown, for example, apparatus for the determination of the total nitrogen of the collagen and elastin fabrics of hides and skins, the amino nitrogen and amide nitrogen, also apparatus for desalting protein hydrolysates. Beckman and other electrodes for the determination of alkaline pH values were shown.

Illustrating the chemistry of leather manufacture were numerous samples showing the effects on the raw material of the tannage process at all stages. In the sphere of organic chemistry were shown specimens of the laboratory work in progress associated with such subjects as the study of the constituents of vegetable tannins, their isolation and the determination of the constitution. Both the condensed and hydrolysable tannins are under investigation.

Corrosion problems in tanneries, and steps to solve them, were illustrated by samples of treated and untreated metals.

Mr. Seaton E. Fox (right) in the information department, of which he is in charge, of the new laboratories at Milton Park, Egham, Surrey, of the British Leather Manufacturers' Research Association. This department is concerned, among other things, with the publication of the association's "Laboratory Reports", "Monthly Digest" and "Members' Journal."

Promoting Safety in Industry

Joint Action Still Awaits Government Support

A PROPOSAL to the Government by the Royal Society for the Prevention of Accidents, to set up a co-ordinating committee to review the whole problem of industrial safety has—for the present—been turned down.

That decision by the Minister of Labour was revealed by Lord Llewellin, president of the RSPA, at the National Industrial Safety Conference, held at Scarborough, this month. The society, he added, would not abandon its proposals, but would put them forward when the time was suitable.

Training in Schools and Works

The president said that those responsible for the society's industrial policy had no intention of waiting on events, but were going ahead with various projects. For example, plans were being made to introduce safety training into technical schools. As a first step, a small committee had been formed, which included industrial safety experts and educationalists, to consider what action could be taken.

It was gratifying, said Lord Llewellin, that the Minister of Education should have sent two inspectors to one of the society's training courses for safety officers.

The proper place to learn industrial safety is inside the works and when an employer takes a worker into his factory it is his duty to see that the new entrant is trained in safe methods of working and not allowed to encounter danger through ignorance, the president maintained.

It was suggested that there should be co-operation between the RSPA and the joint industrial councils. The society's long experience of safety organisation and its knowledge of basic principles would be at the disposal of the councils which, in turn, could contribute specialist knowledge of different industries.

Referring to the reports of the " productivity " teams that had visited the U.S.A., Lord Llewellin remarked that one team had written of works safety committees, safety propaganda and other measures as if such things were unknown in Britain. One is forced to the unwilling conclusion, he said, that the representatives of certain industries know very little about organised accident prevention and, when visiting the U.S.A., made their first acquaintance with safety methods which they could have seen practised by industries in their own country.

Sir Wilfrid Garrett, formerly H.M. Chief Inspector of Factories, who spoke on " Some Newer Ideas of Accident Prevention," said that if the knowledge, now scattered in various Government departments, firms and trades unions and in the minds of safety officers, could be collected and made available in simple form accidents could be so materially reduced as to pay, even in hard cash, for all the trouble involved.

He further suggested that within 25 years it would be found an advantage to concentrate all the inspecting branches dealing with the protection of the worker into one Ministry.

Miss Florence Hancock, the trades unionist, expressed the view that if a job is bad for women it is also bad for men. It should not be a question of preventing women from doing certain jobs, but rather of ensuring that the conditions for men and women alike, in any occupation, are such that the work will not endanger health and safety.

Parliamentary Topics

TO Dr. Stross, who asked if the Minister was aware that the River Thames was so polluted at Teddington that sisal rope was rotten if immersed for one month, and that steel shafting corroded within six months; and whether he would state the chemical nature of this pollution and its source, Mr. Bevan said : I am not aware of any pollution in the River Thames at Teddington at present which would cause abnormal damage of this nature.

* * *

IN answer to Dr. Stross, who asked the Minister of Health if he would promote an investigation to establish whether iodised salt may cause any reaction in persons sensitive to potassium or sodium iodide, Mr. Bevan said he was advised that the minute amount of iodine involved appeared to make any such investigation unnecessary, but the point would be further considered in connection with other representations on these proposals.

* * *

THE ending of the steel allocation scheme, except in respect of sheet steel and tin plate and certain types of tubes and pipes, was announced in a reply by the Minister of Supply (Mr. G. R. Strauss). (*Comment, page 773*).

CHEMICAL EXPORTS IN APRIL

Over £1m. Decrease Since March

EXPORTS of chemicals, drugs, dyes and colours in April, at £7,128,752, were £1,145,638 less in value than the March total. Among countries to which smaller exports of chemicals have been made, compared with last month, are: British West Africa £189,347 (£270,952), British East Africa £122,100 (£132,327), Sweden £218,391 (£299,775), Norway £115,375 (£151,059), Netherlands £207,522 (£248,589), Italy £147,262 (£272,207), Egypt £180,229 (£274,930), U.S.A. £185,800 (£298,215), Brazil £393,563 (£509,599).

Notable decreases, in total exports (March figure in parentheses) were: Nickel salts £22,581 (£37,520), potassium compounds £37,934 (£48,119), sodium carbonate £110,476 (£180,133), caustic soda £260,711 (£309,256), sodium silicate £14,352 (£21,653), tar oil, creosote oil, anthracene oil, etc., £91,762 (£213,818), zinc oxide £63,180 (£100,826).

EXPORTS

	April, 1950	April, 1949
	Gal.	Gal.
Cresylic acid	228,121	73,168
	Lb.	Lb.
Salicylic acid and salicylates	196,279	131,031
Value of all other sorts of acid	£121,602	£112,365
	Tons	Tons
Sulphate of alumina	1,555	2,700
All other sorts of aluminium compounds	1,434	396
Ammonium sulphate	12,849	5,316
Ammonium nitrate	5,012	6,763
All other sorts of ammonium compounds	1,394	1,737
	Cwt.	Cwt.
Bleaching powder	12,580	40,880
All other bleaching materials	11,239	7,848
Collodion cotton	1,301	1,709
	Tons	Tons
Copper sulphate	7,046	9,216
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	36,565	51,336
	Tons	Tons
Fertilisers	1,318	604
Value of gases (compressed, liquefied or solidified)	£24,115	£21,675
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	7,093	3,432
	Gal.	Gal.
Tetra-ethyl lead	102,872	152,217
	Tons	Tons
Magnesium compounds	532	905
	Cwt.	Cwt.
Nickel salts	3,529	4,078
Potassium compounds	4,397	6,435
	Tons	Tons
Salt	18,901	14,474
	Cwt.	Cwt.
Sodium carbonate	208,769	300,275
Caustic soda	193,251	103,148
Sodium silicate	16,012	24,080
Sodium sulphate	2,014	82,342
All other sodium compounds	80,555	69,554
	Gal.	Gal.
Tar oil, creosote, oil, anthracene oil, etc.	1,636,422	2,299,784
	Tons	Tons
Zinc oxide	989	727
Total value of chemical manufactures (excluding drugs and dyestuffs)	£3,854,667	£3,614,873
Value of quinine and quinine salts	£11,221	£29,248
	Lb.	Lb.
Acetyl-salicylic acid	182,993	131,625
	100 International Units	100 International Units
Insulin	580,064	680,732
	Mega Units	Mega Units
Penicillin	658,222	586,729
Total value of drugs, medicines and preparations	£1,371,756	£1,583,847
Total value of dyes and dyestuffs	£945,285	£817,017
Total value of paints, pigments, colours, etc.	£957,044	£875,702
	Cwt.	Cwt.
Plastic materials	42,740	28,913
Value	£566,030	£362,867
	Cwt.	Cwt.
Chemical glassware	960	1,078
Value	£39,788	£38,142
	Cwt.	Cwt.
Fans	3,882	4,149
Value	£107,124	£120,013
	Cwt.	Cwt.
Furnace plant	12,790	8,730
Value	£185,142	£125,291
	Cwt.	Cwt.
Gas and chemical machinery	13,069	37,022
Value	£167,629	£394,183

IMPORTS

	April, 1950	April, 1949
	Cwt.	Cwt.
Acetic anhydride	2,768	9,287
Acetic acid	—	—
Boric acid	900	3,620
Carbolic acid	2,197	—
Value of all other sorts of acid	£67,043	£19,942
	Cwt.	Cwt.
Borax	9,480	7,200
Calcium carbide	—	—
Cobalt oxides	268	448
	Tons	Tons
Fertilisers	26,438	19,415
	Lb.	Lb.
Glycol ethers and glycol ether esters	271,372	678,285
Iodine	—	66,050
	Cwt.	Cwt.
Potassium chloride	525,147	467,259
Potassium sulphate	26,300	18,500
All other potassium compounds	9,327	2,171
Sodium nitrate	—	80,645
All other sodium compounds	7,308	1,271
Carbon blacks (from natural gas)	72,999	32,591
Value of carbon blacks	£296,729	£105,925
Total value of chemicals, drugs, dyes and colours	£2,626,423	£2,044,019
	Tons	Tons
Sulphur	43,247	34,442
Value	£432,503	£286,035
	Cwt.	Cwt.
Gas and chemical machinery	3,313	5,309
Value	£16,450	£49,265

ELECTRONIC POLAROMETER
Improved Accuracy and Speed

AN electronic polarometer designed with the object of getting greater accuracy and higher speed of operation than was obtainable with existing commercial polarographs, was described by C. H. R. Gentry in a paper delivered to the Physical Methods Group of the Society of Public Analysts, recently.

In principle, the instrument differed from existing polarometers in that the maximum polarographic current was measured, rather than the usual "average" current.

This measurement was made by adjusting a potentiometer until an electronic null point indicator was balanced; the current was then read off from the potentiometer to an accuracy of 1 in 1000. By a suitable choice of circuit values, the current was measured in this manner without affecting the emf. applied to the polarographic cell.

For rapid operation, the principle of tangent slope compensation was used, which enabled diffusion currents to be obtained directly without the need for the complete plotting of the polarographic wave or for graphical construction.

This tangent slope compensation was in effect to be considered as an electrical method of graphical construction.

The basic circuits of the instrument have been incorporated in a laboratory model which has been successfully used for several years. The greater accuracy extended the range of polarographic analysis to determinations previously made by volumetric or gravimetric methods.

A commercial model of the instrument has been built by the Mullard Electronic Research Laboratories. This was basically the same as the laboratory instrument but incorporated several improvements. Of particular note were a very stable electronic battery circuit and a method of current measurement which was advantageous for measuring a small polarograph wave preceded by a large one.

For use in conjunction with the polarometer, a dropping mercury electrode had been designed which incorporated a thermostat, capable of taking ten cells at a time, and controlled to within ± 0.05°C.

Photoelectric Spectrometry Group

The Summer School of the Photoelectric Spectrometry Group will be held at University College, Southampton. The course will be from July 8-15, and members will be accommodated in the Connaught Hall.

IMPROVED FREEZE DRYING
U.S.A. Uses Infra-Red Heat Source

A NEW type of freeze-drying apparatus which uses infra-red rays as a heat source is responsible in the U.S.A. for increased production and a 50 per cent cut in the price of ACTH, the pituitary hormone newly employed against diseases such as arthritis and rheumatic fever. The Armour Laboratories, Chicago, reports that the principle speeds up the drying process as much as ten times, and gives a greater yield of the hormone by reducing the loss of potency previously experienced in the drying process. The price of ACTH-Armour Laboratories, Chicago, reports that a gram to $100.

In the ordinary freeze-drying method, the heat was applied by means of a liquid, ethylene glycol, for example, at about 40° above zero. The temperature difference and the effect of the vacuum dried the material in a matter of hours.

The new method substitutes infra-red rays for the liquid as a heat source. The infra-red wave band absorbed by water lies mainly between two and eight microns or 20,000 to 80,000 Angstrom units. This energy, when absorbed directly by the water, heats it to the point where it is evaporated out of the mixture, leaving behind the dry ACTH. The infra-red rays are emitted by a series of fine wires, electrically charged, a few inches below ACTH vials.

The process is said to need only a tenth of the time of the old; it is not necessary to keep the material so cold and a much lower vacuum is used. Wide-mouthed bottles were necessary in the old method to permit free escape of water vapour. It is possible now to cap the bottles loosely and still get efficient drying. This prevents occasional contamination.

Paint Companies Merge

AN important development in the Scottish paint industry is the formation of Federated Paints, Ltd., Glasgow, which has initially a capital of £200,000, and is to acquire at least 90 per cent of the shares of Boyd Stewart & Co., Ltd., Strathclyde Paint Co., Ltd., and Williamson Morton & Co., Ltd., all long established Glasgow firms. The firms will continue to trade under their former names and retain their proprietary brands. Advantage should be gained by the combination of research and administrative activities. The directors of the new group are Messrs. John D. W. Davidson, Gavin Boyd, Charles E. Stewart, James Clarkson, Robert G. Clarkson and W. A. Mackinlay.

I.C.I. RESEARCH ACTIVITIES

Contributions to Fundamental and Practical Advancement

FOR many years Imperial Chemical Industries, Ltd., has made a practice of assisting educational establishments with financial grants, in the belief that it is in its interests to give help, wherever possible, to the bodies which are responsible for the training of scientists and are engaged in the acquirement of new basic knowledge.

In this way a total of about £112,000 is spent annually by the company in the establishment of post-graduate research fellowships in chemistry and allied sciences at various universities and hospitals, special donations, grants for apparatus and chemicals, and the support of special researches of a fundamental character on subjects of direct interest to I.C.I. The company's practice of making these grants without attaching any conditions is regarded by the university and other authorities as being one of their valuable features.

A comprehensive review of these factors and of practical results of the group's own research forms an interesting section of the 23rd annual report of I.C.I., Ltd.

In addition to these grants, the company, it is noted, has contributed to fundamental research and general scientific knowledge by means of work in its own laboratories. Although by far the greater part of this work consists of studies in applied research directed towards the improvement of existing products and processes and the devising of new ones, a considerable amount of more fundamental research is undertaken. This is not only deemed to be valuable in applied research, but to form a serious contribution to the advance of scientific knowledge in general.

Toxic Chemicals

Investigations into the relationships between the chemical constitution of toxic substances and the intensity of their action have yielded much valuable background knowledge which it is hoped will assist in the search for new and effective drugs, insecticides and fungicides. Considerable attention has been given to the factors affecting the growth of crystals, as this has a direct bearing on the handling properties of many of the company's products and in particular on the problem of preventing powders from caking on storage. For example, the discovery that the tendency of ammonium nitrate to cake during storage can be overcome by the addition of a small proportion of a dyestuff called acid magenta has facilitated its handling and has enabled explosives to be made less liable to become hard and insensitive during storage.

A discovery, which is of importance to chemical engineers, was published in 1949 and concerns the explosive limits of gaseous mixtures. It has been shown in theory, and confirmed in practice, that the range of compositions within which a mixture of an inflammable gas and oxygen can be made to explode can be restricted by the addition of another inflammable gas of given characteristics. By this means reactions, which would otherwise be liable to lead to explosions, can be carried out safely.

Lime

Although lime is one of the most important of industrial chemicals, in the past comparatively little fundamental work was done on its reactivity. By the use of modern research tools, such as the electron microscope, some interesting results have already been obtained, some of which contradict old-established ideas regarding the behaviour of lime, and, if properly applied, should increase the efficiency of the many processes in which lime plays an important part.

The company has continued to undertake extensive background research into the chemical and physical structure of polymers, in the hope that this will lead to new and improved plastics. The usefulness of many plastics and other organic materials is still much restricted by their limited resistance to strong sunlight and weather conditions. The company is studying the chemical mechanism of such effects and the possibility of extending the range of usefulness of the polymers by the employment of stabilisers to prevent degeneration in unfavourable conditions.

Many processes used by I.C.I. will work only in the presence of a catalyst. In the past the discovery of a suitable catalyst for any given process was largely a matter of trial and error, but the company is now trying to find a firmer scientific basis for the choice of catalysts. In doing so, very close and friendly relations are maintained with those university research workers who have similar work in hand.

An important group of researches has for its object the widening of the company's business in inorganic chemical raw materials and intermediate products required in rapidly increasing quantities for the production of solvents, plastics, plasticisers, paints and detergents. Many of the heavy organic chemicals have hitherto been obtained from hard currency areas. It is the company's aim to make these materials from coal or its derivatives, or from oil obtainable from sterling sources, and to do so by new and improved processes employing high pressure and other modern techniques.

Cheaper Water-Gas

Important established products of the company, such as ammonia and its derivatives, methanol and petrol, require for their manufacture large quantities of water-gas or of hydrogen made from water-gas, and these raw materials are also required in increasing quantities for new products now being developed. Because of the high cost of the good quality coke from which water-gas is now made the development of cheaper water-gas processes is one of the company's major research objectives. Work on an entirely novel process has already gone beyond the laboratory stage and a large semi-works-scale plant has been erected. There are still several detailed practical difficulties to be overcome, but, if successful, the new process will not only be more efficient than the old conventional method but it will make possible the use as raw material of non-coking coals or cheap coke breeze, thereby helping to conserve the country's high quality coke for essential metallurgical uses.

During the year a new type of blasting explosive was brought to the stage of full-scale production. This type of explosive, of which Unibel is an example, is the outcome of continuous research to improve the safety of coal mining explosives and it has been officially recognised to be as safe as sheathed explosives.

Continued research on the Cellofas range of cellulose derivatives has led to improvements in the method of manufacture and a widening of the range of applications.

New short-delay detonators have been widely tested during the past twelve months and it has been conclusively shown that by their use the ground vibration from a given weight of explosive can be much reduced. This is an advantage when blasting has to be carried on in inhabited districts, as happens in certain open-cast coal sites.

Until recent years, the industrial chemistry of fluorine was comparatively little studied, and the properties and potentialities of fluorine were largely unknown. The company has done much exploratory work in this field and already certain fluorine compounds seem likely to become of industrial importance. Anhydrous hydrogen fluoride is one of the compounds which the company is now producing on a works-scale, and another fluorine product which is growing in importance is Fluon, a plastic with remarkable heat and chemical resistant properties

New and useful additions have been made to the company's range of dyestuffs and textile auxiliary products, an interesting example being Carbolan Salt A, which facilitates the level dyeing of wool with many difficult but otherwise attractive wool dyestuffs. A new range of pigments for colouring viscose in the mass, before spinning, has been developed and is being favourably received.

A special department of the Plastics Division is responsible for research and development work on new synthetic textile fibres. Considerable technical advance has been made in the spinning of Terylene polyester yarn in the continuous filament and staple forms and the pioneer plant is being substantially extended in order to facilitate and widen experimental work with this new fibre in textile industry.

Progress has been made in developing new seed dressings, particularly combined dressings capable of protecting cereals and sugar beet from seed-borne and soil-borne diseases as well as from attack by wireworm at the seedling stage. Developments have also been made in the production and use of smoke generators containing insecticides, for use in the glasshouse against harmful insects.

New Use for Gammexane

Uses for the insecticide Gammexane continued to increase, and an interesting new development was the clearing of triatomid bugs from living quarters in South America. Huts treated once with Gammexane have remained completely free from infestation by these bugs for over a year, and it is hoped that the use of Gammexane in this way will help to reduce the incidence of Chagas disease, which causes great suffering and mortality in South America.

At home, an increased use of fertilisers is probably the most important single means of achieving a larger production of food, and the company is increasing its productive capacity for nitrogenous fertilisers in order to meet the expected growth in demand.

The company has been devoting much effort to solving some of the most difficult problems in the realm of medicine. One

(continued on page 785)

SHRINK-PROOFING OF WOOLLEN FABRICS

Work of the Wool Industries' Research Association

WOOL fibres and fabrics are subject to two main types of shrinkage, resulting from causes which are largely distinct and unrelated. The term "relaxation shrinkage" is self-explanatory. Woollen goods stretched while damp during manufacture, and dried in a stretched condition, will relax and revert to their original length when suitable conditions of moisture and warmth occur. The manufacturer can overcome this either by finishing the fabric without stretch or by relaxing an over-stretched fabric before it is marketed.

Relaxation shrinkage is not peculiar to wool; it is also experienced with cotton, rayon and other textile fabrics. Woollen fabrics, however, can also shrink by an entirely different mechanism known as "felting," the occurrence of which is accompanied by a thickening and hardening of the texture and a decrease in air permeability.

Wool fibres have a slightly rough surface and are rougher in one direction than the other, particularly when wet. When a mass of fibres is wetted and moved about or squeezed, there is, of course, a tendency for the fibres to become matted. This felting or compacting together of the fibres naturally leads to a reduction in the size of the fabric.

Felting does not occur to any serious extent unless the wool is damp or wet, and it is essentially the result of mechanical movement. Unlike relaxation shrinkage, it cannot be reversed by simple stretching, since the original dimensions can only be restored by actually breaking the fibres, which during felting become irreversibly interlooped.

Mechanism of Felting

Felting shrinkage is experienced only in the presence of mechanical agitation and compression, and not during simple soaking or steaming. While some difference of opinion exists as to the exact mechanism by which felting of wool takes place, it is generally agreed that an essential part is played by the ability of the wool fibres to travel root end first when rubbed, a property which arises from the greater roughness of the wool fibres when rubbed from tip to root than when rubbed root to tip.

Practically all processes to prevent wool felting act by changing or removing the surface of the wool fibre which is responsible for this remarkable property. Though usually referred to as "unshrinkable" treatments, they are actually "non-felting" processes and usually do nothing to overcome relaxation shrinkage.

Many promising ideas for the prevention of felting have been suggested by the laboratories. The translation from test-tube to production, however, is liable to be particularly costly and difficult where textile processes are concerned, and the number of processes which have achieved some degree of commercial development still remains relatively small.

Wet Chlorination

It is noteworthy that wet chlorination—the original process introduced some 50 years ago—is still the most widely used shrinkage resistant treatment for wool. It consists in the application of solutions of hypochlorites (originally calcium but now usually sodium) to which varying quantities of acid are added. When the absorption is completed, the wool is rinsed in a clearing bath containing sodium sulphite or bisulphite. Originally, strongly acid solutions of hypochlorite (pH 2) were almost always used.

These acid solutions suffer from the disadvantage that the chlorine is present in a free state and, being only slightly soluble in water, readily escapes from the solution, with the result that unpleasant working conditions are created. A further objection is that such solutions react with wool at so high a speed that it is difficult to ensure level treatment of all the fibres in the fabric.

Treatment tends to be confined to the surface, with the result that the outer fibres are liable to be overtreated and damaged, while many of the inside fibres remain entirely untreated. This results in the production of fabrics with an initial resistance to felting, which, however, tends to break down on long continued washing.

Many attempts have been made in recent years to achieve better control of the wet chlorination processes. Under less acid conditions (pH 2-4) the reaction is a little slower and the tendency of chlorine to be lost to the atmosphere is also reduced. This is even more marked at higher pH (4-8), but, unfortunately, in these more alkaline chlorinations a yellowing of the wool also becomes apparent. Nevertheless, improvement has been achieved by the gradual addition of the chlorine liquor over a period of perhaps 30-40 min., instead of introducing it all initially.

One wet chlorination variant involves soaking the goods first in an acid bath, squeezing them, and transferring them to a second bath containing the hypochlorite. In practice this procedure works well when small batches are handled, but it is difficult to control exactly the carry-over of acid.

An old German process used chloramine T (under the name of Aktivin) for the chlorination of wool, and attempts have been made to improve the wet chlorination process by adding substances like *p*-toluene sulphonamide, which should react with the free chlorine to form chloramine T and then perhaps give up the chlorine slowly again to the wool.

Costly Inhibitors

Such inhibitors are rather costly, and quite often were added in inadequate amounts to absorb all the chlorine. They were used in the U.S.A. during the war, but it is not considered probable that the additional expense would be justified by such advantages as are shown.

A recent development consists in the combination of chlorination, under alkaline conditions, with a treatment by dilute potassium permanganate solution. The two reagents were originally applied in successive baths but are now, as a rule, in the same bath. Uniform treatment is obtained because of the slow liberation of chlorine at high *p*H, the permanganate acting as a bleaching agent to eliminate yellowing of the wool. No special plant is required other than ordinary stainless steel dyeing apparatus.

One of the objections to wet chlorination treatments is the considerable loss of wool substance which occurs. This may be as much as 8 per cent, but in the British finishing trade is usually about 4 per cent. But for this loss of material, the process would be relatively cheap.

Dry gaseous chlorination was introduced by the Wool Industries' Research Association in 1934 to overcome some of the disadvantages of the wet process. In this method the wool is first dried to about 7 per cent " regain " and placed in an apparatus from which substantially all the air is then evacuated. Chlorine gas is admitted and re-circulated for about 40 min. Finally the excess is blown off, the the cycle of operations being completed in about 60 min.

More than 30 million lb. of wool have been treated by this method, which gives a very consistent and reliable product of high shrinkage resistance. Only a negligible weight of wool substance is lost, the cost of the process being between 3d. and 6d. per lb., depending on conditions. The cost of a plant capable of treating 300-400 lb. weight per batch is approximately £1000. One advantage of this process is that the reacting chlorine remains in the wool and can be easily estimated as a means of controlling the degree of treatment.

Of much more recent development is a process using sodium or potassium hydroxide dissolved in 95 per cent ethyl alcohol. The wool must first be dried below 8 per cent regain, and thermostatic control is advisable. A continuous process for tops was evolved but does not seem to have reached commercial development. Some 60 tons of socks were treated up to 1943, after which the process was apparently abandoned.

Advantages claimed for this process were: little change of colour and no damage to the cellulosic fibres also present. Disadvantages are: the fire hazard, possible Excise difficulties with the alcohol, and a slight harshening of " handle."

A similar process developed by Hall and Marsh of Tootal, Broadhurst, Lee, Ltd., uses alkalis dissolved in binary and ternary mixtures of alcohols, e.g., butyl alcohol and white spirit. This process has been used on a small industrial scale.

Sulphur-Chloride Treatment

A process involving treatments with sulphuryl chloride dissolved in white spirit was introduced in 1935. After being tried in several British mills its use was abandoned, but it is understood to have been used in Australia in 1946. The chief difficulties in its practical applications are that the solutions are highly corrosive, noxious and difficult to handle, and also that an unexpectedly careful control of moisture content in the wool and careful cooling of the baths are essential.

The Perzyme treatment is another process evolved by the Wool Industries' Research Association. As now practised, wool is first given a special hydrogen peroxide treatment and then transferred to a second bath containing papain and sodium bisulphite. Papain, the dried juice of the paw-paw fruit, is an enzyme capable of dissolving proteins and, when activated with bisulphide, can be used to give a controlled attack on the surface of wool fibres. Advantages claimed for this process are a simultaneous bleaching and a soft handle in the product. The disadvantages are that the action is interfered with by copper-containing metals or by chrome applied in dyeing.

Chlorzyme is the name given to a composite treatment in which wool is first dry-gaseous chlorinated and then given a special reduced papain treatment which further modifies the chlorinated fibre surface, leaving the unchanged wool unattacked. The usual rough, scaly surface of the wool fibre can then be removed to leave a smooth, soft, lustrous surface without damaging or weakening the interior of the fibre. In addition to being completely unshrinkable, it is claimed that the product loses any tendency to irritate sensitive skins. Wool treated in this way has been sucessfully used as a filling for quilts which require to be washed.

Resins

Resin treatments represent an entirely different approach to the problem and involve the deposition of synthetic resins in or on the wool. The most highly developed processes use alkyl melamino resins with formaldehyde, an acid-releasing catalyst, as ammonium phosphate, and perhaps a wetting agent.

After applying this mixture in a two- or three-bowl pad-mangle to give a 60 to 80 per cent absorption, the goods are dried at 200-280° C. for about 40 min. They are then " cured " by polymerising the resin at 140-204° C. for times ranging from 11 min. to 20 sec., according to temperature. Finally, the uncured resin is removed by washing.

Reduced Shrinkage

While the treatment is intended primarily to reduce felting, it is also claimed to reduce the relaxation shrinkage to about half the original value. Further advantages claimed are that the weight of the fabric is increased by 5 to 10 per cent, enhanced resistance to rubbing-up of fibres on the surface is conferred, and the washing fastness of some colours is increased. A disadvantage is the danger to the wool of the very high temperature curing treatment, which, unless properly controlled, appears to cause yellowing in colour, possible harshening of handle and loss of strength. So far, successful application seems to have been confined to piece goods, and the process has not yet been fully developed for garments or knitting yarns.

I.C.I. RESEARCH ACTIVITIES

(*continued from page* 782)

of these is tuberculosis and, although its cause, the tubercle bacillus, is well-known, the eradication of that organism from the human body presents peculiar difficulties, which can be overcome only by much patient biological and chemical investigation.

Diseases due to viruses form another group which is, in general, unresponsive to drug treatment; in fact this group is in much the same position as were the bacterial diseases before the discovery of the sulphonamides.

Disorders of the brain and the malignant diseases present even more difficult problems, for the root causes of the latter remain unknown, and a far more complete understanding of the mechanism of the brain and its response to drugs is needed before a remedy for diseases such as epilepsy can be discovered.

The company has continued to devote much work to the discovery and development of new uses for its products and to the consolidation and extension of existing markets by appropriate technical service investigations.

A striking example of a new use of a chemical product is afforded by Cellofas B, a cellulose ether product made by the Nobel Division. This substance has been found to possess the property of preventing the " after-greying " which normally accompanies repeated laundering of cotton fabrics, as a result of the redeposition of dirt removed from the fabric during washing with soap or synthetic detergents. The " after-greying " of cotton fabrics by washing, familiar to the housewife in the gradual loss of whiteness of sheets and towels, is a defect which hitherto has restricted the application of synthetic detergents in the laundering of cotton goods, but which is largely overcome by the addition of Cellofas to the laundry bath.

In an entirely different field the company is playing a leading part in extending the use of aluminium alloys to road and rail transport vehicles, and the Metals Division Experimental Building Station is providing information on new uses of non-ferrous metals, particularly aluminium alloys, in the building industry.

In addition to its uses as a synthetic fibre, nylon is proving most versatile in other forms. As an example, nylon monofil is now being produced in tapered form for use as an alternative to natural bristle in paint brushes, and new types of nylon suitable for moulding are now being used for purposes in which toughness and resistance to high temperatures and to solvents are important.

MINOR ELEMENTS AS FERTILISERS

*U.S. View on Encouraging Use of Micro-Nutrients**

IN developing a chemical fertiliser industry those engaged in soil fertility investigations and in supplying plant foods concentrated for years on those nutrients which seemed to be required in largest quantities—nitrogen, phosphorus, potassium and calcium.

Only comparatively recently has there been more comprehensive understanding of the plant needs for other nutrients.

Knowledge is still limited, but the fertiliser industry is now fully aware of the importance of so-called secondary and minor elements in plant feeding. What is not so clear, however, is how, when, and in what amounts these other elements are to be included in formulations.

Toxicity

The problem is complex. These other elements are not generally needed on all soils or crops. Care and knowledge are essential in their application because of the toxic potentiality of some of them to plants and animals.

Boron, for example, may be tolerated in relatively large quantities by some crops, but only in trace amounts in others. Molybdenum may be tolerated in large amounts by the plant, but such plants having a comparatively high content of the element may prove lethal to grazing livestock.

Deficiencies of these nutrients are not entirely peculiar to modern farming.

Nature in many places did not provide in the rocks and the soils derived from them a sufficient quantity of all the major and minor nutrients; or, if these were present originally, they were reduced too far by leaching and cropping. The problem has been aggravated by the decline in the use of animal power on farms. At the turn of the century about 25 million horses and mules were employed on American farms. At present the number has decreased to about 8 million. With the animals has gone the manure, which formerly furnished considerable quantities of micro-nutrients.

However, farmers are learning how to grow abundant, high-quality crops by means of commercial fertilisers and good soil-management practices. One does not have to keep cows to grow good crops. This is not to deny, however, that barn manure from grain-fed animals, where it is available, may provide good insurance against severe deficiencies of minor elements.

Under the intensive system of farming followed by U.S. market gardeners on coastal plain soils involving heavy applications of refined salts of N-P-K carriers, it is to be expected that deficiencies will show up. The level of fertility present might satisfy a small crop, but, for the acreage required by the system to be profitable, the amount of native micro-nutrients present is entirely inadequate.

Another factor is the soil *p*H. These market gardening soils are usually of a sandy open type and acid. To get high yields the grower has to lime rather heavily and frequently. One effect of heavy liming is to reduce the availability of some of the micro-nutrients—manganese and copper, for example.

The fertiliser industry and good fertiliser practices are predicated upon a knowledge of the mineral requirements of crops. As cropping becomes more and more intensified, as more synthetic, concentrated plant foods are accepted by agriculture, this basic knowledge becomes more important, especially for highly specialised farming systems and practices.

Twelve Essential Elements

We recognise now that 12 elements are essential to the growth of higher plants. Each is identified with some problem of crop nutrition. If any one is missing, crop failure results. Other elements besides these 12 are known to produce beneficial effects when applied to special crops. For our purposes, let me suggest grouping these elements into:

(a) A major group, comprising N, P, K, Ca, Mg, S. These elements are needed and are applied in major quantities.

(b) A minor group, comprising Fe, Mn, B, Cu, Zn, Mo, Co. These are required in relatively minor quantities, sometimes in mere traces.

(c) A group of beneficial elements, comprising Na, Cl, Al, Si. Sodium is beneficial to sugar beet; aluminium to azaleas and similar shrubs; chlorine to grain crops, at least in Europe; silicon seems able to

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[*] Abstracted from a paper by Vincent Sanchelli, director of agricultural research, the Davison Chemical Corporation, Baltimore, Md., presented at the New England Fertiliser Conference, New Haven, Conn., in February. (*American Fertilizer*, Vol. *112*, No. 9).

DIALLYL CYANAMIDES

Development of New Industrial Solvents

From A CORRESPONDENT

DEVELOPMENT quantities of diallyl cyanamide, and research samples of dimethyl, diethyl and di-isopropyl cyanamides are now being made available for the first time by the American Cyanamid Company. These are of considerable potential value as solvents for many difficultly soluble substances, particularly some of the newer synthetic resins, such as polyacrylonitrile (U.S. Patent 2,404,725).

Dimethyl and diethyl cyanamides have been suggested for the improvement of nitrocellulose solutions to be used as lacquers (U.S. patent 2,198,173), and the higher allyl cyanamides have shown some promise as plasticisers, either when used alone or admixed with the lower diallyls to provide good solvent-plasticiser combinations (German patent application 172,524, 1942). Other applications found for these cyanamides include their use in hydraulic liquids and in lubricating oils (U.S. patents 2,370,663 and 2,215,591).

Physical Properties

The diallyl cyanamides are colourless, mobile liquids when pure, but they usually darken upon ageing. The boiling point (760 mm.) of dimethyl cyanamide is 160 °C.; diethyl cyanamide 186°; di-isopropyl cyanamide 207°, and diallyl cyanamide 222° (accompanied by slight decomposition). Viscosity (centipoises at 30°) varies from 0.633 for the dimethyl compound to 1.092 for the diallyl cyanamide. The flash point (Tagliabue closed cup) is 71° for the dimethyl cyanamide: 80.5 for diethyl cyanamide: 82.0° for di-isopropyl cyanamide and 96° for the diallyl cyanamide.

All these new compounds need to be handled with great care as, although their toxicity has not yet been fully determined, they are known to be dangerous to inhale and to come into contact with the skin. Preliminary tests with diallyl cyanamide show that it causes acute irritation when applied to mucous membranes, and it may be absorbed through the unbroken skin.

The diallyl cyanamides as a class are readily miscible with the common solvents, such as acetone, benzene, 1,4-dioxane, carbon tetrachloride, ethylene glycol, butyl acetate, etc. Dimethyl cyanamide is, however, only 20 per cent miscible with petrol, petroleum ether and turpentine.
diallyl cyanamides, diethyl cyanamide is the best in the series. Ester gum is insoluble in cold dimethyl cyanamide but soluble in the hot liquid: polystyrene is completely insoluble in this solvent. Cellulose acetate is only slightly soluble in hot di-isopropyl cyanamide and the same applies to methacrylate resin: ethyl cellulose is insoluble in di-isopropyl cyanamides, also in diallyl cyanamide. Methacrylate resin is only slightly soluble in diallyl cyanamide.

Diallyl cyanamides react with boiling water in the presence of mineral acids to form diallyl ureas. The substituted ureas can then be hydrolysed to the diallylamines with either hot alkali or hot mineral acids, or the diallyl cyanamides may be hydrolysed directly to the amines. The diallyl cyanamides are valuable intermediates for the synthesis of a number of potentially useful compounds, including substituted guanidines, biguanidines, normal and iso-ureas and thio-ureas.

MINOR ELEMENTS AS FERTILISERS

(continued from previous page)

substitute for phosphorus to some extent; and so on.

That the fertiliser industry in the U.S.A. is supplying an appreciable amount of micronutrients in its fertilisers was brought out by a report released some time ago by the U.S. Department of Agriculture, prepared by A. L. Mehring and associates.

The average chemical composition of 27 complete fertilisers from this group, selected as representative was:—

	Per Cent
Magnesia, Mg O	0.78
Lime, CaO	16.38
Soda, Na_2O	4.08
Alumina, Al_2O_3	0.58
Copper oxide, CuO	0.006
Iron oxide, Fe_2O_3	0.08
Manganese oxide, MnO	0.024
Zinc oxide, ZnO	0.022
Boric oxide, B_2O_3	0.012
Chlorine, Cl	5.86
Fluorine, F	0.70
Sulphuric oxide, SO_2	20.04
Ammonia, NH_3	2.76
Phosphoric oxide, P_2O_5	9.87
Potash, K_2O	5.36
Organic matter, etc.	6.26
Protein	3.94
Moisture	4.90
Water of hydration	3.58
CORRECTED TOTAL	99.96

The Chemist's Bookshelf

Principles and Practice in Organic Chemistry. H. J. Lucas and D. Pressman. 1949, London & New York. Chapman & Hall, Ltd. Pp. 557. 48s.

This laboratory manual on the preparation of organic compounds is intended for use in a one year's course, but for the purpose of arranging different experiments for individual members of a class a considerable amount of alternative material has been included at each stage. The first 12 chapters (187 pages) deal with theory (reaction rates, equilibrium constants, heats of reaction, bond energies, etc., with tabulated data), solubility, calibration of thermometers, determination of melting points, distillation, etc. They serve as a general introduction to common techniques. The following 32 separate chapters are devoted to the main types of organic compounds, ranging from alkanes and alcohols to sugars and pyrroles, and finally short sections on chromatography and qualitative organic analysis.

Each chapter contains, in addition to detailed instructions on specific preparations, general information about the properties and other possible methods of preparation of the class of compounds considered, and gives cross-references to other chapters, copious notes, questions to be answered by the student, and, in most cases, descriptions of brief experiments designed to illustrate the properties of the compounds prepared. The directions given are clear and precise, and are accompanied by detailed discussions of principles. The authors appear to have thought of every possible mistake that a student can make and to have warned him against it. Nevertheless, supervision by a competent instructor, to approve apparatus assemblies, etc., is presupposed. To offset the unavoidable recipe nature of most of the book there are the numerous sets of questions and the experiments designed to illustrate properties which serve to test the student's powers of observation and inference.

Claims are made that the book may meet the needs of organic chemists for a reference work on organic practice. It would seem, however, that, excellent as the book is for instruction, it is somewhat unsatisfactory for reference purposes for these reasons: the concentration on only a restricted number of reactions, sometimes on only one, used for preparing a particular type of compound; the almost complete absence of literature references; and the meagre information about properties. The section on qualitative analysis, is not dealt with at all. The work merits the attention of all whose concern it is to instruct students in organic preparative work to degree standard.

Long Service to BAC

THE approaching resignation of Mr. C. B. Woodley and his completion of 25 years' service as general secretary of the British Association of Chemists were recalled at a luncheon at the Charing Cross Hotel, London, on May 20. Members of the BAC council assembled to pay their warm regards to Mr. Woodley, to whom a cheque was presented on behalf of the association and a silver rose bowl by one member.

The president, Dr. H. Herbert Levinstein, who presented the association's gift, spoke of the general secretary's long devotion to the association and disclosed that it had been agreed to confer on him the first honorary membership. There were a number of other recognitions of the value of Mr. Woodley's long and devoted services.

Mr. Woodley, recalling the satisfaction he had derived from his service, referred with approbation to the fact that the unemployment insurance fund now amounted to £50,000 and the progress made by many who had benefited from the advice of the BAC in the past. Some 25 per cent of members were now directors, chief chemists, managers or of equivalent rank. Although the BAC had no official trade union agreement, it was regarded as the negotiating body for chemists.

Technical Publications

LARGE-SCALE glass coolers are illustrated in the April catalogue of James A. Jobling & Co., Ltd., Sunderland. One type consists of continuous Pyrex glass pipes through which flows the liquid or gas to be cooled, while cold water is cascaded over them. In addition to the chemical and thermal resistance of the glass tubing, the fact that the liquids or gases being conveyed are constantly in sight is a considerable advantage.

* * *

A NUMBER of half-tone illustrations of switches, sealing glands, lamps, and flameproof unions have been added to the paper on "Permissible Electrical Apparatus for Use in Hazardous Atmospheres" by S. W. Richards which is now published as a booklet by the General Electric Co., Ltd., London. The address was originally delivered at the second annual conference on chemical works safety held at Scarborough in October last, and is reprinted from the proceedings of the Association of British Chemical Manufacturers.

* * *

MECHANICAL applications of permanent magnets and their advantage over electromagnets are described in the April issue of the "Nickel Bulletin" published by the Mond Nickel Co., Ltd., London. Magnetic chucks, torque transmitters, welding clamps and lens-grinding magnets are among the types dealt with in this article.

* * *

DISCUSSION of the main properties of ferromagnetic materials in an electric field is the subject of an article by G. H. Jonker and J. H. Van Santen in "Philips Technical Review" (Vol. II, No. 6). The behaviour of certain chemical compounds such as $KNaC_4O_6$ $4H_2O$ (Rochelle salt) and KH_2PO_4 is shown to resemble closely the phenomenon of ferromagnetism.

* * *

NATURAL derivations, geographical sources, characteristics and applications of chemicals, drugs and essential oils are summarised in a pocket guide issued by J. Brummer, London. This is the second in a series of guides to products distributed by the company.

* * *

METHODS of controlling pumps and the level of liquids in storage tanks by means of electrodes are described in its latest publication (No. 234) issued by Evershed & Vignoles, Ltd., London. A sensitive pattern relay unit is described for the first time. An electro-magnet is connected to the 230-volt mains and acts as the primary transformer, while a coil acts as secondary transformer and develops the 12 volts supply to the electrodes. The relay will operate through a water resistance of 3000 ohms.

* * *

METAL turning of practically all types can be reduced from tangled masses into short chips by the B. J-D flextooth metal turnings crusher, details of which are given by British Jeffrey-Diamond, Ltd., Wakefield, Yorks., in its latest leaflet, No. 1451c.

* * *

DESIGN and Construction of Welded Pressure Vessels, a paper recently read to the Liverpool and North Wales branch by J. R. Dood, is one of the main features of the current issue of the *Journal of Incorporated Plant Engineers* (Vol. II, No. 2).

* * *

CONTINUED expansion of several departments of the plastics industry, and an ever increasing variety of applications make the British Plastics Year Book for 1950 (Iliffe and Sons, Ltd., London, 30s.) of more than ordinary value as a source of information. Of particular interest is the first section, devoted to a review of recent patents, in which it is shown that it is in ethenoid resins that the greatest development is taking place. The make-up of recent editions has been retained, all the nine sections having been expanded and revised.

* * *

THE use of the resonance vibration method of testing spot welds has been successfully employed for testing mild steel structures. Certain difficulties have been apparent, however, when the method is applied to structural specimens constructed of thin sheet, due to the fact that it was necessary to attach masses to the specimen to produce inertia forces. The tests, which have now been outlined by R. Week, Ing. Ph.D. in *Welding Research* (No. 2, April), were, therefore, purely exploratory and were carried out with the object of gaining experience and overcoming the special problems encountered in this particular field of application. The same issue has a review by E. K. Frankl of previous investigations of the behaviour of welded structural connections and describes some new test procedure.

OVERSEAS CHEMISTRY AND INDUSTRY

GERMAN AND SPANISH DEVELOPMENTS

India Establishes Commercial Acid Standards

TOTAL production of synthetic fibres in Western Germany was 190,000 tons in 1949, of which rayon accounted for 47,000, the remainder being cellulose wool. In the eastern zone the total was 60,000 tons.

In the east and west the polyamide fibre, Perlon, was being made in 1949, but production was relatively small. In the Obenburg factory of Vereinigte Glanzstoff-Fab. A.G. an experimental plant is making about 100 kg. per day. The chief type at present is 60 denier yarn, but finer threads are to be made as soon as possible.

A larger plant is being built at Oberbruch, Aachen. Other firms also contemplate manufacture, and it is expected that output of Perlon fibre also will be increased by the Kunstseidefab. in Bobingen, and others. Chief producer of Perlon in the Eastern zone is VVB(Z)-Kunstfaser-Thuringische Zellwolle, of Schwarza (Saale), which is building a new factory with a probable output of 100 tons per day.

It has been decided by the Arbeitsgem. Kunstseide- u. Zellwolle-Ind. to change its name to Industrievereinigung Chemiefaser. Chemiefaser is the general term including rayon, Perlon, nylon and Zellwolle.

Spain

A LONG authoritative report by the director of the chief electrical undertaking in Spain, Unidad Electrica S.A. (or UNESA), Señor J. L. Redonet Maura, gives a detailed account of the present and potential sources of electrical power from hydro-electric and thermal power stations in Spain. The subject is intimately connected with the ambitious two-year plan for expanding the chemical industries. These, and especially the fertiliser manufacturers, are among the largest consumers of electric power.

The present review, published in DYNA, *Revista de la Asoc. Nac. de Ingenieros Indust.*, 25, (4) p. 131-150, recalls that various estimates have been made of the total possible yield from water power generators, ranging from 5 million h.p. in 1908 to 12.5 million h.p. (9 million kW) in 1932. The present author has made a fresh survey, and from his tabulated figures the grand total of 9 million kW is again obtained, of which 1.7 million is already installed, 1.4 million is under construction, and about 5.9 million in various stages of planning. The maximum foreseeable demand is thought to be 36 million kWh per annum.

The possibilities of thermal stations, depending on coal and lignite, are much smaller. In 1948, output of anthracite was 1.5 million tons, of ordinary coal 9 million, and of lignite 1.5 million. Both coal and anthracite showed a small decline compared with previous years and lignite only a slight increase. Four different types of thermal power stations are considered: (a) pit mouth stations using inferior coal; (b) pit mouth stations with richer coal; (c) power stations in industrial centres using good coal; and (d) movable power plants using fuel-oil and coal. Particulars of ten thermal stations belonging to one or other of these groups are given. It is believed the potential electrical yield of these four methods would be: (a) 690,000 kW, (b) 87,500 kW, (c) 211,580 kW, and (d) 31,000 kW; total 1,020,080 kW.

India

THE Indian Standards Institution has drawn up draft standard specifications for sulphuric, hydrochloric, nitric and boric acids.

The standard for sulphuric acid covers the technical, battery, pharmaceutical and analytical reagent grades: for hydrochloric acid, the technical, pharmaceutical and analytical reagent grades; and for nitric acid, technical, nitration, pure and analytical reagent grades.

The specifications prescribe the minimum content of the acids and their specific gravities. The limits for residue on evaporation, iron oxidising impurities, heavy metals (lead), arsenic and other insoluble impurities have been fixed. Clauses relating to containers, method of packing, marking and sampling of the acids are also included.

The standard for boric acid (commercial) prescribes the acid content of the material, the limits for free moisture and soluble iron compounds. For use in electrolytic condensers, the limits for chlorides, sulphates and heavy metals are also included. The method of sampling and analysis of boric acid is stated in the form of two appendices.

• HOME •

Explosion at Aluminium Works

An explosion last week at the experimental mill of the Northern Aluminium Company, Banbury, Oxfordshire, killed two men and burned two others. They were working just outside the building.

Record Coal Output

Coal output last week represented a record for 1950—4,535,900 tons, compared with 4,389,900 tons the week before. The previous best, in the week ended December 17, 1949, was 4,574,300 tons.

Whales for Fertiliser

Part of the school of whales washed up on the Scottish coast near Dunbar were last week taken on lorries to Warrington on their way to the Riverside works of Henry Quennel, Ltd., for conversion to oil and fertiliser.

Rise in Chemical and Metal Prices

The price index of non-ferrous metals last month was 277.6 (274.3 in March). This is an increase above April, 1949 of 5.4 per cent. The chemicals and oils index was 201.5 (196.6 in March) and shows an increase of 5.5 per cent above April, 1949, according to statistics published in the *Board of Trade Journal.*

Petroleum Distributor's Economy

Scottish Oils & Shell-Mex, Ltd., which is the marketing organisation for the Shell and Anglo-Iranian Companies, is to reduce the number of its divisions in the United Kingdom from 18 to 10. This re-organisation is expected to assist in lowering the costs of petroleum and fuel oil distribution. The regrouping of divisions to align with the refineries now being built is stated to be one of the reasons for this decision.

Plastic Materials Freed

The Board of Trade announces that from June 1 the following will be added to the list of materials which may be freely imported from countries participating in the freer trading arrangements: fluorspar; carnauba wax; ouricury wax; casein; caustic potash; copper sulphate; phenol and cresol formaldehyde moulding powders and resins; polyvinyl chloride; sodium chloride; urea formaldehyde moulding powders and resins. Amendments have removed from the list of exceptions to the free import principle the following: Butyl acetate, butyl alcohol, ethyl acetate, ethyl lactate, ethyl silicate, ethylene glycol, glycol ether esters, glycol ethers, iso-butyl alcohol, lactic acid, triethanolamine.

Dunlop Gifts

The Dunlop group has sent £50 to the Manchester Joint Research Council and 50 guineas to the National College of Rubber Technology.

New Edinburgh Quarters

Griffin and Tatlock, Ltd., have moved to new premises at 8-13 Johnston Terrace, Edinburgh, which will afford enlarged scope for handling their range of scientific equipment and laboratory equipment.

Copper Price Raised

An immediate increase in price of electrolytic copper by £6 from £164 to £170 a ton, delivered, was announced by the Ministry of Supply on May 19. This followed an increase of £2 a ton the previous day.

A BIF Record

Overseas visitors at the British Industries Fair numbered 19,005, a record, and home trade buyers 113,102. The comparable figures in 1949 were 17,061 and 121,555.—The Secretary for Overseas Trade.

Loans to Chemical Industry

Loans and investments approved for chemical industries by the Industrial and Commercial Finance Corporation, Ltd., from September 1945 until March 31, 1950, amounted to £1,719,100. This is 8.3 per cent of the total capital invested in some 50 industries.

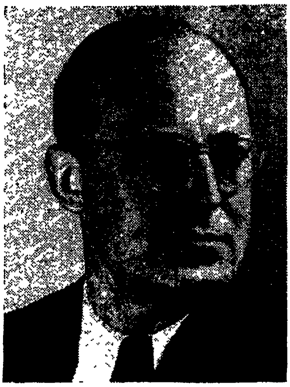
Engineering Research Centre

Work on the DSIR project at East Kilbride, where a mechanical engineering research centre is being built, is reported to be making good progress. Structural steelwork is being erected on the main site, roads are under construction and ancillary facilities are being established. The centre will undertake research in a number of chemical engineering subjects.

Isotopes in Industry

A conference for industrial engineers, chemists, metallurgists and others interested in the application of artificial radioactive substances to industrial problems was held last week-end in Birmingham. Three scientists from the Atomic Energy Research Establishment, Harwell, Dr. W. J. Arrol, Dr. W. G. Morley and Dr. H. Seligman were among the lecturers. The conference was arranged by the Extra Mural Department of Birmingham University in co-operation with the Atomic Scientists' Association.

• PERSONAL •



Mr. W. F. Mitchell

MR. HENRY J. TALBOT has been appointed joint managing director of Dorr-Oliver Co., Ltd. In association with Mr. J. M. Lee, he will be responsible for the general management of the company. Mr. Talbot, who for the past few years has been a director and chief engineer of Dorr-Oliver Co., Ltd., is also a director of the various Continental subsidiaries of the Dorr Company of America.

MR. H. IRWIN has been elected to the board of Triplex (Northern), Ltd., the safety-glass firm of St. Helens, Lancs. Mr. Irwin, who is 52, joined the company as general manager in 1946, and had previously held design and administrative posts in the plate and sheet glass works of Pilkington Brothers, also of St. Helens.

DR. J. B. TOOGOOD, aged 24, an organic chemist at the Huddersfield branch of I.C.I., Ltd., has been awarded one of six scholarships for the whole country, financed by American firms, to attend a four-months course at Massachusetts Institute of Technology. Dr. Toogood, a native of Newport, Mon., hopes to study applied chemistry in relation to works management.

The King's Commendations have been awarded to MR. W. I. INESON, chief chemist, and MR. F. J. WADSWORTH, relief shift engineer and general assistant, at the Birkshall gas works, Bradford. In February they extricated Mr. H. Horsfield, junior clerk of works, from a pit in which he had been overcome by gas fumes. He has since died.

To control its increasing chemical activities, the Shell Petroleum Co., Ltd., has formed a department of chemical industry management, which is to administer the company's chemical commercial enterprises throughout the world, except Canada and the U.S.A. MR. W. F. MITCHELL has been appointed head of the department.

MR. IAIN M. STEWART, son of the late Sir Frederick Stewart, has been appointed chairman of Thermotank, Ltd. A B.Sc. of Glasgow University and of the Royal Technical College, he joined the board and became managing director in 1945.

SIR EDWARD APPLETON last week delivered a commemorative broadcast on the occasion of the centenary of the birth of Oliver Heaviside, the mathematical physicist, whose conclusions relating to the earth's upper atmosphere (the Heaviside Layer) Sir Edward verified.

DR. F. S. DAINTON, B.A., B.Sc. (Oxford), Ph.D. (Cambridge), has been appointed professor of inorganic and physical chemistry at the University of Leeds. The appointment will date from October 1 this year. Dr. Dainton, who is 35, became a university lecturer and later a Fellow of St. Catherine's College, Cambridge, and is at present Praelector and director of studies in physical science at the College.

The Court of Governors of Manchester University has approved the recommendation of the senate and council to confer the honorary degree of M.Sc. on DR. W. H. BRINDLEY, M.C., for industrial and public services. Dr. Brindley is librarian to Hardman & Holden, Ltd., of Manchester, and he has been the hon. secretary of the Manchester section of the Society of Chemical Industry for many years.

The honorary degree of Doctor of Science of Leeds University was presented last Saturday to EMERITUS PROF. ROBERT W. WHYTLAW-GRAY, professor of chemistry at Leeds 1923-45.

MR. DONALD HAMILL, who has completed 30 years' service with John W. Leitch & Co., Ltd., Huddersfield, was last week presented with a silver tea set.

MR. EVAN CHARLES EVANS, Forest Hill, West Kirby, late technical director of Goodlass Wall and Co., Ltd., left £3728 (net £3234).

◆ OVERSEAS ◆

Belgian Steel Expansion

The Belgian metallurgical concern S.A. Ougrée-Merihaye proposes to modernise its rolling mill at a cost of $16 million, half of this sum to come out of ECA allocations. Its capacity, when completed, will total 378,000 tons.

Brussels Plastics Fair

The Office Belge des Matières Plastiques is arranging its third Plastics Fair from June 10 to 25, 1950, in the Palais du Centenaire. Inquiries are being received by the Office Belge des Matières Plastiques, 326 rue Royale, Brussels.

Wax and Petroleum

Construction will begin in Eastern Venezuela next year of a new refinery and wax producing plant with an annual capacity of over 2 million lb. of high grade wax for the U.S. Phillips Petroleum Company.

Guarantee Stamps for Pharmaceuticals

To protect the public against traffic in unauthorised products, all drugs, medicinal products and cosmetics, both national and foreign, sold in Colombia now have to bear a guarantee stamp. Value of the stamp is added to the sale price and the resulting revenue is to be used in a hygiene campaign.

Leuna Works in Russia?

Statements by former German prisoners-of-war who have returned from Soviet Russia claim that the Leuna works of Merseburg (Russian zone of Germany), formerly the largest and most up-to-date plant for the manufacture of synthetic petrol in Europe, has been removed during 1946-47 and erected in the region of the Dniester estuary, between Tiraspol and Nikolayev. A number of German experts are said to have been compulsorily transferred there.

U.S. Aluminium Production

February witnessed the starting of the reduction plant of the Aluminium Company of America at Point Comfort, near Port Lavaca, Texas. This is the first plant to be constructed since the war, and utilises natural gas as a source of power. Total output of primary aluminium in the U.S.A. during February declined by 8 per cent to 50,688 short tons, because of the shorter month. The daily average output, however, increased, and the total was 919 short tons more than the same month of 1949.

Optical Glass for India

The Government of India is to install an optical glass factory of 10-12 tons capacity, adjacent to the Central Glass and Ceramic Research Institute, which will be responsible for its technical guidance.

Austrian Fertilisers for Hungary

A trade agreement between Austria and Hungary provides for the Austrian Nitrogen Works, of Linz, to export 80,000 tons of chemical fertilisers, worth about $2 million.

Zinc Production in Italy

Italy's zinc production is expected this year to reach pre-war figures. With Marshall Aid, it is planned to construct a 9000-ton capacity zinc electrolytic plant which is expected to be completed in 1953.

Dutch Colorants in Germany

The Dutch Dye Manufacturers' Union is complaining that, despite a treaty with Germany for the free import of colorants, the German Federal Government will not now authorise such imports. The Dutch industry, claiming that as a result it has suffered considerable losses, is seeking reparations.

Chile's New Steel Centre

Chile's first integrated steel plant, begun in 1947 and costing more than $70 million, has started operation. Erected near Concepcion, for the Pacific Steel Company of Chile, its blast furnace is designed to produce 700 tons of iron per day. The plant has an open hearth furnace, a Bessemer converter, an electric furnace, and auxiliaries for handling tar, light oils and gas.

Rising Total of Italian Cement

During the first quarter of the current year, portland cement works in Italy registered an increase in output of about 30 per cent compared with the corresponding period of 1949. The increase, most unusual in Italy at this time of the year, is accounted for by improved supplies of coal and electric power and an increased demand. Numerous hydro-electric schemes are being carried out involving heavy use of portland cement. During 1949 nearly 8.5 million tons of portland cement products were produced in Italy, some 10 per cent more than in 1938. During the current year an output of about 10 million tons is expected. Italian cement exports in 1949, principally to Mediterranean countries, realised 1000 millon lire.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Auratone Laboratories, Ltd., London, W.C. (M., 27/5/50.) April 25, £2000 charge, to H. E. G. Piper, London, and another; charged on 1 The Barracks, Westcott (Sy.). *£2648. June 2, 1948.

Clay & Son, Ltd., London, E., manufacturers of manures, etc. (M., 27/5/50.) April 20, assignment securing to Midland Bank, Ltd., all moneys due or to become due to the Bank; charged on a contract. *£6000. October 15, 1947.

Denton & Jutsum, Ltd., London, E., varnish manufacturers. (M., 27/5/50.) April 20, £25,000 mort., to Legal & General Assurance Soc., Ltd.; charged on factory premises in Stour Road, Bow, E.3. *£35,000. January 14, 1949.

Hilden Laboratories, Ltd., London, E.C. (M., 27/5/50.) April 18, £500 deb., to R. G. Warren, Farnham; general charge. *——. February 14, 1950.

Pest Control, Ltd., Bourn (Cambs.). (M., 27/5/50.) April 6, £500,000 secured stock together with a premium of up to 4 per cent, payable in certain events, secured by a trust deed dated March 31, 1950; charged on properties specified in schedule to deed, and a general charge.

Pest Control (United Kingdom), Ltd., Bourn (Cambs.). (M., 27/5/50.) April 6, Trust Deed dated March 31, 1950, for securing £500,000 secured stock of Pest Control, Ltd., together with a premium of 4 per cent, payable in certain events; charged on properties specified in schedule to deed (subject to etc.), also a general charge. *£218,364. January 14, 1949.

Satisfactions

Flinto, Ltd., London, W., manufacturers of enamels, etc. (M.S., 27/5/50.) Satisfaction April 26, of charge reg. January 28, 1949.

Sheppy Glue & Chemical Works, Ltd., Horley. (M.S., 27/5/50.) Satisfaction April 21, £60,000. reg. September 18, 1928.

Company News

Boots Pure Drug Co., Ltd.

A final dividend of 20 per cent, less tax, on the £1.92 million of ordinary capital for the year ended March 31, is recommended by the board of Boots Pure Drug Company. This makes a total for the year of 40 per cent (same). The group net profit, subject to audit, was £1,060,614 (£1,070,734).

Glaxo Laboratories, Ltd.

The interim dividend is announced as 5 per cent on the ordinary stock. The equivalent distribution last year, after allowing for the bonus issue, was 5.4d. per 10s. unit.

Powell Duffryn, Ltd.

Powell Duffryn, Ltd., announces a dividend of 2⅜ per cent, less tax, on the £3.6 million 4¾ per cent cumulative preference stock for the half year to June 30, 1950. Payment will be made on July 1, to holders registered on June 2, 1950. Dividends on the 4¾ per cent cumulative preference stock for the 6 months periods will in future be paid on July 1 and January 1.

Ciba Success in Italy

The Ciba-Industria Chimica, Milan, the Italian subsidiary of the Swiss group, which produces chemicals, pharmaceuticals dyes and cosmetics for the Italian market, reports an increase in net profits last year from L. 14 million to 21 million.

Norwegian Aluminium

A gross working profit of £250,000 in 1949 is reported by AS Aardal Verk, the large aluminium works established by the Norwegian Government after the war. The output of aluminium last year was about 10,000 tons, but extensions are in hand which will raise production considerably. The aluminium has markets in Denmark, Sweden, Finland, the Soviet Union, Poland and Belgium.

Increases of Capital

The following increase of registered capital has been announced: Mediplastics, Ltd., from £3000 to £6000.

(continued on next page)

Chemical and Allied Stocks and Shares

STRENGTH of British Funds has been the outstanding feature of the stock market. This has been evidenced by the response to the East Africa Loan terms, the premium of up to 11s. 3d. on the new 3½ per cent Electricity stock and the belief that the issue of some £20 million of British Coal stock, to be made later this month, is also likely to be a 3½ per stock offered at slightly under par.

Gilt-edged stocks have attracted a good deal of buying because sentiment in regard to industrial shares has been influenced by rising costs, which connote reduced earnings in future for a wide range of companies. In most cases, however, it seems that it should be possible to maintain dividends, and, before long, the good yields now ruling on industrial shares may attract a better demand. On the other hand, markets are governed largely by the belief that the general election will be held later in the year.

Shares of chemical and kindred companies have reflected the somewhat uncertain conditions in the industrial sections of markets. In most cases, movements were small and indefinite, but buyers of leading shares followed any reaction in prices. Imperial Chemical were active amound 40s. 9d., awaiting the annual meeting on June 8, which the market expects to reveal whether I.C.I. will have to raise more capital this year. Monsanto were 48s., F. W. Berk 2s. 6d. shares, at 15s., remained under the influence of the financial results. Albright & Wilson 5s. shares (28s.) remained steady, Amber Chemical 2s. shares were 4s. 9d., Boake Roberts 5s. shares 26s., and Bowman Chemical 4s. were 5s. 3d.

Brotherton 10s. ordinary again changed hands around 19s. 6d. Pest Control were 7s. 9d., L. B. Holliday 4½ per cent preference 19s. 9d., and, elsewhere, Fisons strengthened to 25s., and William Blythe 3s. were quoted at 9s. 3d. xd.

There was a sharp reaction in Glaxo Laboratories at 46s. 9d., the 5 per cent interim dividend being lower than had been expected in the market. It is clear, however, that the company is following the policy of abiding by dividend limitation and, in the circumstances, it is unlikely that much more cash will be distributed as dividend than before the big increase in the capital which resulted from the share bonus. It is realised that earnings are such as to permit a substantial increase in dividend, if dividend limitation should end.

Boots Drug have been firm at 48s., the 40 per cent dividend on the larger capital being maintained. Turner & Newall, at 80s. 6d., were easier, following the unchanged interim dividend, and United Molasses were higher at 42s. 6d. on the full results. The 4s. units of the Distillers Co. moved up to 18s. and British Plaster Board strengthened to 16s.

Iron and steel shares remained firm after the decision to end steel rationing, except for steel sheets and tinplate. Guest Keen rallied to 42s. 6d., Stewarts & Lloyds were 54s. 10½d., United Steel 25s. 7½d., and Dorman Long 30s. 6d.

Shell eased to 66s. 3d. despite the group's large profit, the market being disappointed that the dividend is again limited to 7½ per cent, tax free.

LAW AND COMPANY NEWS

(continued from previous page)

New Registrations

A.L.X. (London), Ltd.

Private company. (482,201). Capital £100. Cleaners and treaters of leather-ware, manufacturers of chemical compounds, manufacturing chemists, etc. Director: Alexr. Fried. Reg. office: 64 Aldermanbury, E.C.2.

Bacterol (1950), Ltd.

Private company. (482,249). Capital £5000. Manufacturers, etc., of sterilising equipment, disinfectants and insecticides. Director: A. Binnie. Reg. office: Plantation House, Mincing Lane, E.C.3.

Bullus & Co. (Dyers), Ltd.

Private company. (482,255). Capital £10,000. Dyers and finishers, carbonisers, chemical manufacturers, etc. Directors: T. E. Bullus; T. Bullus. Reg. office: 28 East Parade, Leeds 1.

Brockwell Plastics, Ltd.

Private company. (482,254). Capital £500. Manufacturers of plastic modelling and moulding materials, etc. Directors: G. J. Clarke. F. E. Clarke and G. R. B. Clarke. Reg. office: 196 High Street, Bromley.

A. Leete & Co., Ltd.

Private company. (482,198). Capital £10,000. To acquire the business of paint and varnish manufacturers carried on as A. Leete & Co., at 129/30 London Road, Southwark, S.E.1. Directors: D. C. Leete, Sybil F. Leete, S. A. Cook. Reg. office: 129/130 London Road, S.E.1.

Prices of British Chemical Products

First Effects of the New Freight Rates

THERE has been no lack of interest in the industrial chemicals market and buying for home account has covered good volumes. Export inquiry also is reported to be well maintained. Although there have been no outstanding price changes during the week, the undertone is firm in most sections and some adjustment in quotations to cover the increased transport costs seems unavoidable. Among the soda products, there is a strong demand for soda ash, chlorate of soda and hyposulphite of soda, while available offers of the potash chemicals are quickly absorbed. The lead oxides are in steady request at the higher rates now ruling. There has been a good demand for pitch, crude tar and creosote oil, and the xylols and naphthas continue the subject of good inquiry.

MANCHESTER. — Reasonably satisfactory trading conditions have been reported on the Manchester chemical market during the past week. Delivery specifications covering textile and other industrial chemicals are circulating freely and a fair amount of fresh inquiry concerning home and overseas business has been reported. Generally firm price conditions continue. In the market for the by-products, crude tar, creosote oil and carbolic acid are in steady request and a good demand has been reported during the past few days for the xylols and most of the other light distillates. Quieter conditions are now being experienced in the fertiliser trade.

GLASGOW.—The Scottish chemical market has shown little change, apart from the seasonal increase in demand for paris green and low concentration DDT dusting powders. There have, however, been numerous increases in price resulting from the increased road, rail and sea freights, and these increases have, as usual, a bigger effect on Scottish industry than English.

Price Changes

Rises: Ammonium sulphate, cobalt oxide, litharge, naphthalene, pyridine, red lead, salicylic acid, white lead, zinc oxide.

Reductions: Cream of tartar, cresylic acid, naphtha, pitch, tartaric acid, toluol.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, Diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£160 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d, to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£140 10s. per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 7¼d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 2s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1260 s.g. 128s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £85 per ton; dark tech., £75 per ton ex works; barrels returnable.

Lead Acetate.—Nominal.

Lead Carbonate.—Nominal.

Lead Nitrate.—Nominal.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £114 5s.; orange lead, £126 5s. Ground in oil: red, £136 15s.; orange, £148 15s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £123 10s. per ton, Ground in oil, English, under two tons, £143.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£114 5s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d. £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅜d. per lb.; ground, 10⅜d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £6 13s. to £7 13s. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—Manchester: 2s. to 3s. 3½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 16s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. Manchester: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 15s per ton, d/d, in drums; broken, £25 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—160° Tw., £6 16s. to £7 16s. per ton; 140° Tw., arsenic free £5 10s. per ton; 140° Tw., arsenious, £5 2s. 6d. per ton; Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 5s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £100 10s.; green seal, £99 10s.; red seal, £98.

Zinc Sulphate.—Nominal.

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Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £10 12s.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 17s. I.C.I. Special No. 1, £16 11s. National No. 2, £11 0s. 6d. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal, ex works: 90's, 3s. 3d.; pure, 3s. 5¼d.; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale 98%; 3s. 3d. per gal.; 99.5/100%, 3s. 11d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £9 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works; export trade, 110s. per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/160°, 22s. 6d. MANCHESTER: 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2¼d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d, per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: May 23. The prices of all refined oils and fats remain unchanged during the eight-week period ending on July 12. The prices of all unrefined oils and fats remain unchanged during the four-week period ending on June 3.

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2 at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process and apparatus for the preparation of thermoplastic powders.—C. Pasquetti. March 5 1947. 638,992.

Manufacture of substantially anhydrous sodium soap lubricating greases.—N.V. De Bataafsche Petroleum Maatschappij. March 20 1947. 639,203.

Starch processing and products.—R. T. Vanderbilt Co., Inc. April 1 1947. 638,996.

Refining of naphtha produced by the distillation of coal tar.—Midland Tar Distillers, Ltd., D. W. Parkes, and I. A. M. Ford. April 14 1948. 639,137.

Powder metallurgically produced materials and processes for making the same.—American Electro Metal Corporation. April 28 1947. 639,138.

Vitreous enamelling materials and processes.—Poor & Co. May 16 1947. 639,055.

Production of diethyl ketone.—E. I. Du Pont de Nemours & Co., W. F. Gresham, R. E. Brooks, and W. E. Grigsby. June 8 1948. 638,917.

Tertiary amines and methods for obtaining the same.—Parke, Davis, & Co. July 7 1947. 639,217.

Process for the preparation of diaminotriazines.—Produits Chimiques de Ribecourt. July 16 1947. 639,218.

Apparatus for electroanalysis.—A. H. Stevens. (Zbrojovka Brno, Narodni Podnik). July 24 1947. 639,219.

Aldehyde-phenol-phenol ether condensation products.—Harvel Corporation. July 30 1947. 639,220.

Process for purifying agar-agar.—T. S. Lian. Aug. 1 1947. 639,222.

Microscopy.—F. H. Smith. Aug. 5 1948. 639,014.

Process for the manufacture of dl-3, 4-(2^{1}-keto-imidazolido)-tetrahydrofurane-(2)-n-valeric acid and intermediates therefor. —Roche Products, Ltd. Aug. 7 1947. 639,149.

Cooling of gases in re-circulating gas systems.—Westinghouse Electric International Co. Aug. 7 1947. 639,150.

Production of magnesium oxychloride cementitious compositions. — Westvaco Chlorine Products Corporation. Aug. 8 1947. 638,926.

Pterin compounds and process of preparing same.—Parke, Davis, & Co. Aug. 26 1947. 639,154.

Production of caustic magnesia. — K. Konopicky. Aug. 29 1947. 639,228.

Penicillin manufacture.—I.C.I., Ltd., J. Dobson, H. Gudgeon, and T. Leigh. Oct. 13 1948. 639,281.

Manufacture of diamino-diphenyl-ureas. —Ciba, Ltd. Nov. 11 1947. 639,021.

Crystallisation of penicillin.—E. Lilly & Co. Nov. 18 1947. 638,938.

Emulsions of ethylene polymers and interpolymers.—I.C.I., Ltd., and L. Seed. Nov. 17 1948. 639,025.

Process of activating the oxidising power of chlorite solutions.—Solvay & Cie. Nov. 19 1947. 639,235.

Electrodeposition of solid ethylene polymers.—E. I. Du Pont de Nemours & Co. Jan. 8 1948. 639,084.

Method of making chlorine dioxide.—Mo Och Domsjo A/B. Jan. 9 1948. 639,085.

Magnesium titanate phosphors.—British Thomson-Houston Co., Ltd. Jan. 14 1948. 639.086.

Treatment of ferrous metals.—I.C.I., Ltd., and J. B. Delany. Jan. 26 1949. 638,948.

Finishing of anodised aluminium. — Altones, Ltd., and W. J. Campbell. Feb. 20 1948. 639,090.

Aqueous solutions containing soapless detergents.—I.C.I., Ltd., and F. J. Pollok. March 2 1949. 639,173.

Method of making organic silicon compounds.—Mo Och Domsjo A/B. March 8 1948. 638,951.

Methods of eliminating moisture from the surface of moisture absorbent sheet material on which metal is to be deposited by thermal evaporation in a vacuum, and apparatus for so treating the material.—P. Alexander. March 15 1949. 639,099.

Ion-exchange processes for the treatment of liquids.—Permutit Co., Ltd. April 5 1948. 638,956.

Manufacture of nicotinic acid-β-picolylamide.—Roche Products, Ltd. April 23 1948. 639,246.

Methods of forming germanium films.—British Thomson-Houston Co., Ltd. June 23 1948. 639,109.

Mixing and homogenising apparatus.—T. Giusti & Son, R. B. Giusti, and T. Giusti. June 22 1949. 638,966.

Ionisation chambers.—O. R. Frisch. March 12 1945. 639,251.

Apparatus for manufacturing reinforced tubes from thermoplastic materials by extrusion.—Soc. Per Azioni Lavorazione Materie Plastiche. May 2 1946. 639,538.

Heat-treatment of magnetic alloys containing iron.—Telegraph Construction & Maintenance Co., Ltd., W. F. Randall, and H. H. Scholefield. Oct. 24 1947. 639,252.

Method of preparing opaque films from synthetic linear polyamide compositions.—Munising Paper Co. Jan. 9 1947. 639,327.

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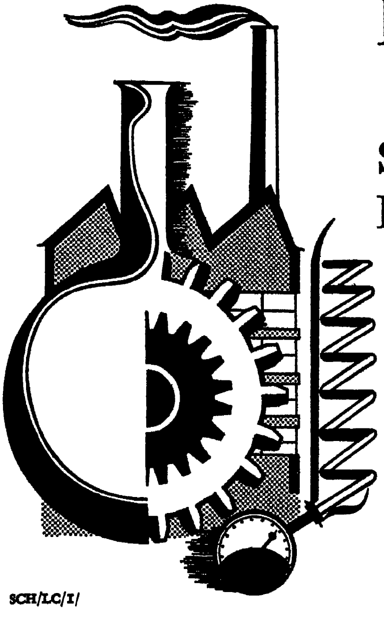

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Volume LXII 3 June 1950 Number 1612

Aids to Literary "Navigation"

NO scientist can keep perpetually afloat in to-day's flood of papers on subjects in which he has—or bravely feels he should have—some direct and detailed interest. Even more severe is the problem of the young scientist entering a specialised field of research or technology for he possesses none of the "hunches" born of experience to guide him on the face of the waters. But, as is observed in the current issue of *Endeavour* (1950, 9, 34, *edit.*), it is easier to state this problem than to offer a solution. It is one of those resistant problems with a natural growth-rate greater than any likely rate of reduction by palliatives and remedies. At no time has it been more difficult to keep in line with the main front of scientific advance; nor in the past could developments in one field make such widely distributed impacts in other fields. Some of the newest subjects—radio-isotopy antibiotics, chromatography, and modern ionic exchange, to mention a few—cut right across the departmental streams of research and industrial development.

Abstracts can never be wholly adequate. They are seldom up to date and their brevity excludes even passing allusions to subsidiary details. The review or survey type of article helps to keep specialists in touch with progress elsewhere, but the journals in which these broader papers appear are limited in number, as are the scientists with the ability and time to prepare them. Few indeed are the number of journals, in this country or any other, having the scope and impartiality of *Endeavour* and *Research.*

Two hopeful developments are discussed in *Endeavour*, the freelance "literature-searching" services, and the microfilm or photostat methods of publication. The extent to which the former service will be used, and so the extent to which such work will be economically attractive to those who might carry it on, will depend upon the effectiveness of the reports. The basic usefulness is vouched for by the fact that the bigger companies and research associations have created their own literature-searching departments which enjoy, however, the marked advantage of having specialist observers peculiarly fitted to distinguish what is really significant. The second development, the microfilm, promises above all else to help in decentralising the literature. Even in some of our cities with populations of more than 500,000 specialised library facilities are

On Other Pages

Leader:

Aids to Literary " Navigation " . 805

Notes and Comments:

Chemical Blacklist . . 807
Gas Without Coke . . 807
Underground Lurgi Process? . . 807
Colonial Potentialities . . 808
" Appalling " Conditions for Technical Training . . 808
In Praise of Chemists . . 809
Chemical Industry's Capital Needs 810
Growth of Mineral Research . . 811
ISM Meets in Spain . . 812
French Scientific Instruments . . 812
Mechanical Handling Exhibition . . 812
High-Strength Hydrogen Peroxide 813
New Uses of Synthetic Vitamin K 814
Background to Oil Additives . . 815
Drugs and Fine Chemicals in 1949—VII . . 817

METALLURGICAL SECTION

Improved Production of Stainless Steel . . 819
Film Record of British Steel Achievements . . 820
Heat Resistance of Zirconium Alloys 822
Steel Production and Techniques . . 823
Non-Ferrous Metals Production and Stocks . . 824
Fire Hazards of Magnesium Alloys 825
India's Penicillin Programme . . 827
Plastics Development in Madras . . 827
American Chemical Notebook . . 828
Canada's Chemical Totals . . 828
World Power Conference . . 834
New Oil Standard . . 834

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extremely limited. The small microfilm card should enable progressive libraries to present far more current technical literature, besides simplifying the wider distribution of specialised publications by post. The benefit to the library service depends, however, upon the provision of considerably larger regional funds to support microfilm publication and stocking. The technological institutions of the future, about which so much has lately been said and written, might for these modern services be more appropriate centres than the traditional city libraries, which have many other interests to serve.

Whatever the physical improvements in the future and however much the labour of access and search may be reduced, the final condition—as *Endeavour* emphasises—is that the worker must always be mainly dependent upon his own efforts. The greatest aid he can look for will be his own growing familiarity with the abstracts and journals, the text-books and monographs. The research worker needs to acquire the same facility for finding his way in scientific bibliography and modern library reference systems as the habitual " hiker " brings to his Ordnance Survey map. It is the unsatisfactory custom to leave students to learn these things by chance or necessity, whereas, on the most practical grounds, the subject should be included in all degree courses.

While conferences are held to co-ordinate and improve national and world systems of publication and abstracting, few scientists are being given any training in even the elementary technique of using existing facilities. We should make sure that present and future generations are not sent from the universities and colleges with the same blind spot.

More than ever, an ability to find ones way about in the classified literature is an essential part of the scientist's equipment. The need is certainly not confined to those whose main duty is research; the industrial chemist, treading a broader technological path, must rely to an even greater degree upon other people's research. The proposition that practical application of research cannot flourish without full assimilation is incontestable—and is generally ignored.

Notes and Comments

Chemical Blacklist

THE gradual strangling of trade channels which formerly linked with the rest of the world countries now subject to the edict of Moscow is apparent in the generally insignificant amounts of chemical trading in either direction between this country and the Iron Curtain states. The initiative for much of this restriction has come from Moscow. Action by the U.S.A. authorities now indicates the existence of a firm policy, with appropriate penalties, to ensure that the countries in the U.S.S.R. orbit do not reinforce their industries by circuitous shipments of scarce chemicals from the West. A Zurich company which purchased from the U.S.A. 20 tons of dioctyl phthalate, ostensibly for Swiss paint and varnish industries, has been banned from receiving any more U.S. goods subject to export licence control. The phthalate was traced to Czechoslovakia by the U.S. Office of International Trade officials. Their lively detective service is stated to have brought to light a number of other cases which may result in blacklisting of European importers of U.S. chemicals.

Gas Without Coke

THE eagerness to hear further results of the underground gasification experiment at Newman Spinney is justified by the important effects which this attempt might bring to the coal gas industry alone. Little of a concrete nature, however, is to be expected until the current tests of temperature and composition of the gases have been studied very closely. The gas industry's interest is closely bound up with a long-standing defect of the contemporary carbonisation method, its inflexibility. Increased gas production involves a more or less proportionate rise in coke production, with which the demand seldom corresponds. The industry has long been interested in complete gasification processes which would eliminate the economic problem associated with coke. The main interest here, of course, always lay in the water gas process, particularly with oil enrichment, which gave an outlet for surplus coke by gasifying it. At the same time there have been proposals to use oxygen in gas manufacture, to make the water gas process continuous by adding oxygen to the steam supply in order to produce the heat needed in the endothermic water gas reaction. From Newman Spinney now may come a process which could produce gas without the possible economic embarrassment—coke. Once the technique of starting, controlling and stopping gasification underground is mastered, one would expect the next step to be enrichment of the gas. Steam, steam with oxygen and oxygen enriched air might all be applied to enrich the gas of this process which is at present still part-carbonisation, part-producer gas reaction. This also has implications for the tonnage oxygen industry. Recent statements suggest that the Ministry of Fuel is contemplating only the production of gas of low calorific value possibly for use in a specially-designed gas turbine. While this must, of course, be one of the possibilities, it will appear to some to represent a rather limited objective.

Underground Lurgi Process?

IT is being recalled that the Lurgi Company in Germany proposed a process in which a new factor was introduced. The company gasified lignite under a pressure of several atmospheres, with oxygen. In this way diluting the gas with nitrogen was avoided, but they also claimed that working under pressure shifted the equilibria favourably. The gas consequently contained 20 per cent or more of methane and had a calorific value similar to that of normal town gas. Whether such an idea would be practicable here depends, among other things, on the permeability of the strata bounding the coal. However, since a pressure percolation method of linking two holes has been stated to be one of the next steps in the work, and this would require impermeable bounding strata, an underground Lurgi process, adapted to bituminous coal might well be worth consideration.

Colonial Potentials

ANY effort to stimulate interest in this country in the economic build-up of the Commonwealth just now is more obviously deserving of support than ever before. A document entitled "Colonial Production and Potentialities," issued recently by the Empire Economic Union, sounds as though it belongs to that category. In fact, while it arouses interest, it offers very little to sustain it. An introduction by Mr. L. S. Amery states that the pamphlet shows at a glance the commodities already produced in each of our Colonies, as well as potential products. Maize, for example, could be grown in British Honduras; cocoa cultivation might be expanded in Dominica. The sentiments are admirable, but the fact that the pamphlet does no more than indicate "potentialities or present production" by means of a + sign in either case leaves the seeker after information very little the wiser. No indication is given how to distinguish the two. Many minerals are listed, but no figures are quoted to show the quantities now being raised or what sort of increase might be achieved. It is no help to know, for example, that tortoises and turtles are in production (or could be) in the Seychelles, and hard to interpret the significance of the apparent lack of donkeys and mules in Basutoland. If this compendium of generalisations has point we have missed it. On firmer ground, however, is the one solid, statistical table which really teaches some useful things about each country—its status, population, area, capital city, etc. That, one notes, is republished with acknowledgments to Ernest Benn, Ltd.

"Appalling" Conditions for Technical Training

NEGLECT of facilities for technological training was attacked by Mr. J. Wilson, principal of Birmingham Central Technical College, in his speech at the recent annual conference of associateships.

Conditions to-day, after many years of neglect, almost without exception, were appalling, he declared. In Birmingham, many years ago, the authorities had sought to establish new colleges of technology, commerce and art at Gosta Green; yet only one-third of the project had been sanctioned and only one-ninth of the constructional work involved was progressing—slowly.

Urging swifter action on a national scale, Mr. Wilson proposed a bold experiment in a new kind of technical institution which could be devoted entirely to advanced vocational training in technology, commerce and art, and to operational research on behalf of industry. No better place than Birmingham existed for such an experiment.

Birmingham Central Technical College, in spite of the handicap of inadequate accommodation and out-of-date buildings, had succeeded in maintaining the highest standards of teaching, as results had proved.

By 1955, when its diamond jubilee would be celebrated, the college would have trained more than 100,000 technical students for industry.

In 1948, the speaker pointed out, of the boys leaving secondary schools, two per cent went to universities and 93 per cent entered paid employment. It was from this large pool that technical colleges drew their students.

Action for Freedom

The need to eradicate the "could not care less" philosophy was urged by Miss Pat Hornsby-Smith, M.P., at a recent luncheon of the Society for Individual Freedom, in London. Our pre-war prosperity sprang from the natural genius of the people, she said. Preservation of the pioneer spirit that had made the country great could be ensured only by a return to individual responsibility. Too few were willing to take a lead in the fight against totalitarian government.

IN PRAISE OF CHEMISTS

Generous Recognition at Engineering Group Dinner

THE essential character of chemical knowledge in several vital fields, medicine, surgery, as well as chemical engineering, was testified to by authorities at the annual dinner in London on May 24 of the Chemical Engineering Group of the Society of Chemical Industry. Speakers on that theme were the society's president, Mr. Stanley Robson, and Baron Webb-Johnson, the eminent surgeon, who was the principal guest.

The chairman, Mr. Norman C. Fraser, proposed the toast of "The Society of Chemical Industry," calling to mind the international ramifications of its work, and he coupled with the toast the name of the president, formerly chairman of the engineering group, who had continued his genial and kindly help.

Mr. Stanley Robson, responding, recalled that his period in office was one of the most pleasant phases of his life. On looking into the work of the society and of its groups and sections, one was impressed, he said, by the way in which chemistry entered more and more intimately into every modern activity.

The chemist was producing new synthetic materials which in many cases had better qualities and properties than the materials—frequently more expensive and hard to come by—which they replaced.

Influence of the Chemist

Some of the society's other groups dealt with fine chemicals, roads and building, agriculture, food, and in all those spheres the influence of the chemist was always increasing, and there was the chemical engineering requirement. He was confident that the Chemical Engineering Group, the oldest group in the society, would maintain its part as one of the leaders in chemical engineering activity. Its programme for the coming year covered a wide range of interest. Emphasising the importance of physical chemistry, he said that a good chemical engineer to-day must have a background of physical chemistry; as an unrepentant chemist he could not forget the chemistry in chemical engineering.

Mr. Julian M. Leonard (immediate past chairman of the group) proposed the health of the guests.

Lord Webb-Johnson, in his response, discussed the place of chemistry in his own field of activity. He recalled that, when he was a student, teachers had no conception of the application of chemistry. The student to-day realised, however, that if he were not well equipped in chemistry and physics and had not a knowledge of research work in biology, it was of no use pretending to bring scientific treatment to the bedside. The chemist had come back to the bedside.

Medicine and surgery owed an enormous debt to chemistry, not only in respect of therapeutic chemicals, but in the antibiotic and other fields; the results of collaboration between the workers in the biological laboratories and the chemists were extraordinarily fruitful, and the outstanding organic chemists concerned were worthy of the highest commendation.

Work on Hormones

The synthetic compounds allied to the hormones had a thousand times the power of anything the human body could create. They were astounding in their possibilities. Professor Dunn's work on the hormones, which had led to the discovery or the application of his synthesis of stilbœstrol, with the aid of the manufacturing chemist, had opened up an avenue which might show the way to a method of treating a dread disease by swallowing some remedy or having it injected, instead of having to submit to the ordeal of surgery. The speaker was proud, as one who had devoted himself for half a century to the application and practice of surgery, to feel that the main efforts of surgical science were devoted to making surgery unncessary.

The company at the dinner included the following:

Dr. L. H. Lampitt (past president of the society, and the first recipient of its International Medal), Dr. Hughes (hon. secretary of the society), Col. Griffin (general secretary), Mr. H. V. Potter (chairman, Plastics Group). Mr. A. L. Bacharach (chairman, Food Group), Professor D. M. Newitt (president, Institution of Chemical Engineers), Mr. L. O. Newton (hon. secretary of the Institution), Sir Harry Jephcott (chairman, Association of British Chemical Manufacturers), Mr. J. Davidson-Pratt (director, ABCM), Major V. F. Gloag (chairman, British Chemical Plant Manufacturers' Association), Professor Cooke (president, Royal Institute of Chemistry), and Major-General A. E. Davidson (president, Diesel Engine Users' Association). Many of the guests are also members of the Chemical Engineering Group.

The Annual Meeting

THE Chemical Engineering Group of the Society of Chemical Industry, at its annual general meeting reported a satisfactory year, in which the usual full programme of meetings in London and joint meetings with local sections of the society was carried out. Mr. Norman C. Fraser, chairman of the group, presided, and was subsequently re-elected the group's chairman for the second year.

The report for 1949 presented by the hon. secretary, Mr. E. LeQ. Herbert, showed that membership had remained steady. The pre-war practice of visiting works was resumed in 1949. The group continued to be responsible for the preparation of the chemical engineering section of the SCI's annual reports on Applied Chemistry, the work being undertaken during the current year by Dr. G. Edwards, of Glasgow.

At the request of the society, work had been started on the preparation of a history of the chemical engineering group, for inclusion in the history of the society which it is proposed to issue in 1951, to commemorate its 70 years of existence. The work, undertaken by Mr. R. F. Stewart, was reported to be well under way.

The closest co-operation had been maintained with the Institution of Chemical Engineers.

Messrs. H. C. S. de Whalley, T. W. Howard, J. Watson Napier and C. A. Robb were elected to the general committee, and Mr. H. V. Potter, who was co-opted in 1949 to fill a casual vacancy, was re-elected. The following officers for 1950-51 were also re-elected:—Chairman, Mr. Norman C. Fraser; hon. secretary, Mr. E. LeQ. Herbert; hon. treasurer, Mr. F. A. Greene; hon. editor, Major D. M. Wilson; hon. recorder, Mr. H. W. Thorp.

Chemical Industry's Capital Needs

Confirmatory Experience of Albright & Wilson, Ltd.

TYPICAL of the experiences of some other chemical manufacturing firms in needing to seek outside sources for the capitalisation of the development of their businesses are those of Albright & Wilson, Ltd., recorded by its chairman, Mr. Kenneth H. Wilson, at the company's 58th annual general meeting last week.

New Chemical Projects

Next year they would celebrate their centenary. They anticipated that it would find them with major additions to their productive capacity in the course of erection, with new chemical projects in hand, and with increased research and development facilities nearing completion. Their plans were completed for a new block of research laboratories in which an enlarged staff would be working with improved facilities.

Dealing with the question of capital, Mr. Kenneth H. Wilson said for nearly 100 years the cost of expansion of the company from very small beginnings had been met almost entirely out of profits retained in the business. High taxation now made it impossible for them to rely to a sufficient extent on that sound and proper method of finance. Their programme for the future made it essential that more capital should be introduced into the business in the not too distant future. They were awaiting Government approval of their plans.

The profit of the group, before taxation, attributable to the shareholders, for the year 1949, amounted to £912,735, which, compared with a profit of £964,791 for 1948, showed a reduction of £52,056. The net profit attributable to the shareholders after charging U.K. and overseas taxation, and deducting the profit attributable to outside shareholders of subsidiary companies, amounted to £426,417.

Capital Expenditure

The net current assets stood at £1,900,597, a decrease of £230,042 as compared with the previous year. Capital expenditure was the reason for this reduction, and they had now reached the position where their remaining liquid resources were locked up in stock-in-trade and debtors, said the chairman.

Sales of the parent company were the highest in its existence and were some 7 per cent in excess of those of the year 1948 in value. The demand for their products, both in the home and export markets, continued to outrun their capacity to supply. The position was acute and could only be dealt with by a large-scale expansion of plant on a new site. Their plans were ready for this expansion and they were now awaiting Government permission to put them into effect.

Their export trade had been maintained, and every effort was being made to increase their turnover in this direction. A conference with their agents from many foreign countries had recently been held in London and at the works at Oldbury and Widnes, where they were able to explain their developments, their problems, and their hopes for future trade.

GROWTH OF MINERAL RESEARCH

Government's Aid to Commonwealth Surveys

THE growing recognition by the Government of the urgent need to extend mineral and soil research in the Colonies is seen in its policy of promoting and encouraging geological surveys since the war.

Under the Colonial Development and Welfare Act, 1945, £1 million was allocated for these surveys and Colonial governments were told they should apply for grants to expand existing survey organisations, or create new organisations where these did not exist.

From then until January this year more than that amount has been granted to territories in all parts of the Commonwealth, particularly to Africa, West Indies and Eastern dependencies, such as North Borneo and Sarawak.

Some details of these grants appear in *Commonwealth Survey* (No. 47, 25-30). They are intended to cover periods of five years and include: Kenya, £116,500, Uganda, £66,000, and Tanganyika, £128,800, to expand existing geological departments; Nigeria, £107,000, expansion of survey organisation and investigation of coals, iron ores, non-ferrous ores, etc.; North Borneo and Sarawak, £107,650, combined survey; British Guiana, £142,000, investigation of mineral resources and provision of buildings, etc. In addition, the ECA Act, 1948, set aside £106,000.

The good work of Dr. Frank Dixey, who, in 1947, was appointed geological adviser to the Secretary of State for the Colonies and director of Colonial Geological Surveys, is cordially acknowledged.

Colonial Collaboration

One of his first duties was to prepare a scheme for a Colonial geological survey and later he visited a large number of territories to discuss proposals for expansion or development of survey departments.

In 1947 he visited East and South Africa and it was agreed among the Governments concerned that periodic conferences of directors of Colonial survey of neighbouring Colonies should be held with as many other geologists as possible, to enable mutual help by the exchange of staff and equipment. The first of these took place at Entebbe, Uganda, in 1949.

In 1948, Dr. Dixey visited Jamaica, British Honduras, Trinidad, British Guiana, Barbados and St. Lucia, and discussed the desirability of investigations into mineral deposits, water supplies, volcanic phenomena, road metals, building materials, soil erosion, etc.

The Government adviser has also visited universities and other institutions in Britain to explain the advantages of a geologist's career and in 1948-49, after circularising Commonwealth departments some highly qualified men were secured. This year it has been estimated that staff requirements will average 25 a year until 1952 and 12 from 1953-56.

During 1948-49 the Economic Co-operation Administration offered to try to supply geologists and chemists to assist the survey staff during the next three years. A scheme was formally approved in 1949, providing for 25 American geologists to be attached to the Colonial Geological Survey. Canadians also may be employed.

Programme in Cyprus

The wide scope of the research to be undertaken with a grant of £46,000 recently made to Cyprus by the British Government is typical of other activity throughout the Commonwealth.

In Cyprus, the survey will be concerned, primarily, with the plutonic and volcanic rocks in the western part of the island, and will cover some 900 square miles. All the known deposits of copper and iron pyrites, of chromite and asbestos, are located there, but no detailed modern geological survey has been made of the whole area.

The investigation will employ geophysicists as well as geologists to locate ore-bodies, and provision has been made for a final test by diamond-drilling.

Apart from the possible discovery of new deposits, the survey will yield valuable information concerning building stone, the rate of weathering of rocks, the relationship between geology, topography and erosion, and the distribution of different types of clay and soil.

Copper is the most important mineral in Cyprus and is produced in a variety of forms, *e.g.*, copper concentrates and cement copper. The output of pyrites comes from two mines; the Mavrovouni mine of the Cyprus Mines Corporation in the north-west, and the Kalavassos mine of the Hellenic Mining Co. in the south.

The island's exports of minerals have been increased more than ten-fold in the past 16 years. In 1949, their value was £3,675,000.

ISM MEETS IN SPAIN

Visits to Fertiliser Sources

THE International Superphosphate Manufacturers' Association, during its annual series of meetings in Madrid recently, attracted a record attendance of some 300 delegates and members of their families, representing superphosphate manufacturers and suppliers of the raw materials of the industry from all parts of the world.

Delegates were entertained by the Spanish superphosphate manufacturers at the country house of Mr. Remigio Thiebaut near Madrid, where they witnessed a demonstration of bull-fighting, and attended a banquet and other functions in Madrid.

After the meetings, delegates went to Seville, where they were entertained by the Rio Tinto and Tharsis Companies, and visited the pyrites mines of the two companies.

A delegation of about 40 members went by plane to Morocco at the invitation of the Office Chérifien des Phosphates, staying three days in Marrakesh and visiting the phosphate mines at Khouribga.

The following officers were elected or re-elected for the year 1950/51:—

President, Mr. R. Standaert (Belgium); vice-presidents, Mr. R. Audouin (France), Mr. J. Capelo (Spain), Mr. B. Colbjörnsen (Sweden), Mr. F. G. Clavering Fisons (U.K.), Mr. H. Stevenius-Neilsen (Denmark); secretary, Mr. R. M. Collins.

Arrangements have been made to hold the 1951 series of annual meetings in Switzerland, and at the invitation of the French members, a series of technical meetings will be held in Paris in the autumn of 1951. The offices of the Agricultural Committee have been removed to 1, Avenue Franklin D. Roosevelt, Paris (8e).

Scottish Fertiliser Expansion

SCOTTISH Agricultural Industries, Ltd., is planning a major expansion at its Carnoustie, Angus, works at a cost of £80,000. The intention is to provide storage space for 14,000 tons of granulated fertilisers in bulk and to install new packaging, weighing and handling machinery to pack and dispatch fertiliser at the rate of 60 tons per hour. The Carnoustie plant was laid down in 1840 by Charles Tennant and Co., Glasgow. Another scheme for substantial developments will make the S.A.I. Ayr depot one of the largest fertiliser and allied product plants in the country.

FRENCH INSTRUMENTS

The 47th Exhibition at the Sorbonne

AMONG the several French exhibitions of scientific instruments the one organised by the French Society of Physics is the most remarkable and its success increases every year. In 1949 the number of exhibitors exceeded the available space and restrictions had to be imposed. In 1950, thanks to the Rector of the Sorbonne, M. Sarrailh, who obligingly lent the imposing entrance hall of the university, all demands for stands could be satisfied and 132 exhibitors found accommodation, writes our Paris Correspondent.

This large following is due to the efforts of the society and its board, of which Professor Eugene Darmois is president, to establish and maintain a permanent link between pure and applied science. In the first exhibition, before the first World War, the former still predominated; at present, however, the latter is prevailing. This development is certainly not to be deplored. To-day many manufacturers of scientific matériel have now their own laboratories where application quickly follows the discoveries of pure science.

On the whole, the exhibition of 1950 shows the important role science plays in French life. The big State laboratories have made remarkable progress, not only in research but also in production.

Among these institutions, the National Centre of Scientific Research presented different instruments and matériel in the fields of mechanics, optics and electricity.

Mechanical Handling Exhibition

AMONG numerous full-size exhibits to be shown at the second National Mechanical Handling Exhibition and Convention will be a 20-ton mobile crane, a tippler for tipping a 10-ton railway wagon, pneumatic grain-handling plant, and a wide range of conveyors, lifting equipment, stackers. At this exhibition, to be held at Olympia, London, from June 6 to 17, some 170 firms will occupy 200,000 sq. ft. of space, compared with 130, occupying 55,000 sq. ft. at the first exhibition in July 1948. During the convention, which runs concurrently with the exhibition, a number of papers will be read, and opportunity will be given for discussion by various sections of industry. The report of the Anglo-American Council on Productivity, published on May 19, is one of the subjects for discussion.

HIGH-STRENGTH HYDROGEN PEROXIDE

Growth of its Importance as a Propellant

EVEN when viewed against the impressive total of Allied and enemy technological achievements, German production and utilisation of high-strength hydrogen peroxide during World War II must be regarded as highly significant. Largely as a result of the efforts of Dr. Walter, a German chemical engineer, who commanded useful political connections, high test peroxide, as it is known in this country, advanced from its pre-war status of a laboratory curio to that of a specialised energy producer of proven reliability and commercial utility.

Prior to 1940, 80 per cent peroxide excited but little interest in Britain, but by 1945 German production had risen to 15,000 tons per annum with at least 25,000 tons per annum planned. The main bulk of this production was by the electrolytic persulphate process, but I. G. Farben had worked out an interesting organic synthesis, based on 2-ethyl anthraquinone, from which a considerably cheaper product was obtained.

The wide range of uses to which 80 per cent hydrogen peroxide has been put derives from its high content of available oxygen and the exothermic nature of its decomposition into oxygen and steam. This energy release may be brought about by pumping the peroxide through a suitable catalytic bed consisting, for example, of platinised pumice, or special " stones " depending for their activity on manganese or chromium compounds.

Versatile Power Source

Alternatively, the peroxide stream may be continuously mixed with a small proportion of permanganate solution in a reaction chamber. The resulting mixture of steam and oxygen, at a temperature of 485°C., may be used for reaction propulsion, or converted by means of a turbine into shaft horse power.

Thus, peroxide may be used by the former process in " cold " rocket motors for providing heavy aircraft with extra thrust during take-off, or, by the latter method, for driving turbo pumps which may be of considerable power, as, for example, in the V2 rocket. Generally speaking, in any application requiring the rapid generation of gas at pressure peroxide may be employed.

Considerably more energy may be released, however, by burning a suitable fuel, such as hydrazine hydrate or petrol, with the peroxide, either directly, as in the Me 163 rocket motor, or after prior catalytic decomposition. This latter method of gas generation was employed to drive the turbines of the Walter trackless submarine which was thus enabled to proceed under water at the somewhat surprising speed of 30 knots.

The Sprite aircraft engine

The military possibilities of peroxide have been fully appreciated (the development of a British peroxide-driven submarine was recently announced) and it is interesting to note that there has been one important civil aeronautical application. With the advent of the jet-propelled airliner, the specialised problem of take-off efficiency in high-altitude tropical regions has necessarily received consideration.

It is recognised that when operating from such airfields the turbo-jet engine suffers, as a result of the reduced air density, a loss of power which may in certain circumstances amount to as much as 25 per cent. Consequently, some form of thrust augmentation which may be brought into use when necessary to supplement the main motors is highly desirable. Here assisted take-off rockets provide what is probably the most satisfactory answer to the problem of getting the aircraft " off the deck " under adverse climatic conditions with a minimum take-off run.

In view of the projected commercial use of the Comet airliner on Empire air routes, the Sprite assisted take-off unit, designed by the de Havilland Aircraft Company, is a logical by-product of modern aeronautical development. Two of these units will provide a total additional thrust of 4½ tons for a period of 12 seconds during the take-off run and, when airborne, the additional weight incurred is of the order of 700 lb.—quite a bargain, aerodynamically speaking.

The filling of each unit with 40 gal. of peroxide and the requisite amounts of permanganate catalyst and compressed air is easily carried out with a special ground servicing trailer.

Considerations of corrosion and compatibility have to some extent dictated the choice of wetted materials in the ATC unit and service trailer, but research and recent experience have shown that in the past these attendant difficulties have tended to be over-emphasised. It is probably true that the high purity and stability of British HTP has materially assisted the designer of the Sprite unit by permitting a wider choice of structural materials and processing methods. 18/8 stabilised chromium-nickel steels, already widely used in the chemical industry, are extensively employed for construction of the units. Fabrication is mainly by argon-arc electric welding.

It seems assured now that HTP, despite its present high cost, will ultimately give great service in this specialised application on civil jet aircraft; but it cannot, as yet, economically compete with such oxidisers as nitric acid for applications in hot rocket motors.

It is obvious that the tonnage sales of this chemical must rise steeply as production costs are reduced. The aircraft industry, which has good reason to be aware of the similar sequence of events in relation to aluminium metal, does not need to be reminded of this fact.

New Uses of Synthetic Vitamin K

THE compound, 2-methyl-1, 4-naphthoquinone, which possesses high antihemorrhagic activity, is now assuming growing importance as an intermediate in the preparation of pharmaceutical products, textile and leather chemicals, cosmetics, food packaging and processing specialities and wood treating chemicals.

Its vitamin K activity is being utilised to an increasing extent and its effectiveness as a bacteriostatic and fungicidal agent qualifies the quinone for uses where non-toxic compounds are required to be employed at very low concentrations.

Bacteriostatic effects have been observed on *staphylococcus pyogenes aureus in vitro*, employing a dilution of 1 : 150,000; higher concentrations show bacteriocidal effects. Similar observations have been noted for *Photobacterium phosphoreum*, E. Coli, *Penicillium notatum*, *B. Anthracis* and streptococci.

Basic Characteristics

This new quinone is a bright yellow solid having a melting point of 106° C. It possesses a low volatility and slight tendency to sublime; purification can be carried out by steam distillation. 2-methyl-1, 4-naphthoquinone is readily soluble in benzene and other aromatic solvents, chlorinated solvents and diethyl ether.

Moderately soluble in methyl alcohol, ethyl alcohol, acetic acid and ethyl acetate it is only sparingly soluble in water and petroleum ether. Rapid and reliable methods have been developed for the analysis of this chemical using colorimetric methods (Menotti, *Ind. Eng. Chem., Anal Ed.*, *14*, 418 (1942).

The compound is unreactive in the presence of dilute mineral acids and organic acids but it is attacked by mineral acids to form many different compounds, for example, the quinone undergoes the generic reaction of 1,4-addition to the quinoid system by reagents such as hydrogen chloride and hydrogen bromide. 2-methyl-1, 4-naphthoquinone is very sensitive to alkali and ammonia which cause the formation of deeply coloured and highly complex substances.

Oxidation can be carried out fairly easily using hydrogen peroxide in aqueous alcohol in the presence of sodium carbonate. Under these conditions is formed the epoxide, 2-methyl-1, 4-naphthoquinone-2, 3- epoxide, which can be converted into a range of potentially useful compounds, such as phthiocal (2-methyl-3-hydroxy-1, 4-naphthoquinone). Common reducing agents, such as stannous chloride or sodium hydrosulphite convert 2-methyl-1 4-naphthoquinone into 2-methyl-1, 4-dihydroxy-naphthalene.

One of the most important addition reactions involves the addition of bromine to the quinone to form the dibromide. This can be dehydrobrominated by sodium acetate to form 2-methyl-3-bromo-1, 4-naphtho-quinone. The vitamin K compound reacts readily as a dienophile in the Diels-Alder reaction with conjugated diolefins.

The alkylation of 2-methyl-1, 4-naphthoquinone, is worth noting. It can be methylated in the 3-position by acetyl peroxide; longer chains may be introduced by the reaction with a fatty acid in the presence of red lead (Pb_3O_4), the product being 2-methyl-3-alkyl-1, 4-napthoquinone.

BACKGROUND TO OIL ADDITIVES

*Stages in the Growth of a Great Industry**

IN 1937, Maverick and Sloane wrote " a crankcase oil of the future should be made with the same precision and understanding that metallic alloys are made to-day," and they went on to say " for certain uses there is no doubt but that synthetic materials will compose the complete lubricant."

We are inviting you to consider whether this 13-year old prophecy has in fact been borne out and whether any developments will modify this outlook. We can perhaps understand where we are going if we review the path we have traversed in reaching our present state of knowledge. In so doing we believe we can show that Maverick and Sloane's forecast has been amply fulfilled and that the lubricating oil industry with the aid of chemical additives and of synthetic lubricants can meet the most exacting requirements demanded of it.

It is difficult to trace the first introduction of an additive to a lubricant but it was certainly prior to the use of petroleum oils, for during the fatty oil era inventors were striving to produce superior lubricants by artful compounding. In 1848, Michael Joseph John Donlan provided what may have been the first detailed account of such a process.

It was only 4 years later that a patent issued to George Hutchison, of Glasgow, stated that to impart to common oils a degree of fluidity equal or superior to that of sperm oil it is necessary to mix with them some portions of an oleate possessing a still higher degree of fluidity than even the oleate of crotyl. It was claimed that the oleate of the oxides of ethyl, methyl and of the bases of the other alcohols, possess this quality. This seems a most striking anticipation of the ester compounds employed to-day.

Seaweed Jelly

In the same year, Dennison and Peel patented their new lubricating compound which was prepared by boiling seaweed in water and extracting the jelly for admixture to Gallipoli olive, rape, whale and other oils.

In America, too, fanciful compounds were finding their way to the Patent Office. S. M. Mott in 1861 offered industry " a superior lubricator for machinery prepared by adding salt, saltpetre, unslaked lime, bar soap and water to rock oil or mineral oil." Similarly, a composition patented by Taylor in 1865 consisted of a lubricating oil containing sulphur, and (believe it or not) emery powder. In 1886, Catherine Fink, of Baltimore, produced a lubricating compound consisting of a mixture of animal, vegetable or mineral oils with lime-water, French chalk, muriate of ammonia, carbonate of ammonia, bicarbonate of potash, boreate of soda and sulphur.

To the credit of the early inventors are patents which are still reflected in to-day's methods. Such are Hendrik's, issued in 1862, covering the use of petroleum oils to which were added mixtures of fatty oils and sulphur, and his patent of 1869 which describes the use of lead soaps of whale oil in lubricants.

Imaginative Formulations

So much for the pioneers of additive manufacture. Their formulations were perhaps coloured more by their imaginations than by any understanding of the basic problems involved, but it is remarkable how closely some of the additives in common use to-day are related to them.

During this time, however, studies of a more fundamental nature had not been neglected. Starting with the classical experiments of Beauchamp Tower in 1883, the work of Osborne Reynolds, Sommerfeld, Langmuir, Hardy and others prepared the way for the commercial application of oiliness agents of a precise nature in the Germ process of 1920 in which small amounts of free fatty acids were incorporated into lubricating oils.

In this period large numbers of other lubricating compositions were developed. Through the use of these so-called " compounded oils " significant advances in practical lubrication were made. Most of these developments concerned lubricants for industrial machinery and steam engines, whereas the lubricating requirements of the early internal combustion engines were not regarded as critical and could be met adequately by the oils provided by the conventional refining processes of that time.

The property which early inventors were striving to enhance was oiliness. It was a most important property in those pioneering days, when clearances between moving parts were not always uniform and higher viscosity mineral oils were in common use. To some extent the earlier concept of oiliness included what we now call " film strength " or " extreme pressure " properties and may have even been confused with viscosity. It was not until after 1920 that the rapid advances in internal combustion engine design caused industry generally to become aware of other important characteristics.

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*Abstract from the paper "Alloyed Oils," by R. D. Streeton and A. C. Mauchan, presented before the London Branch of the Institute of Petroleum on May 23.

Mention must be made of other significant processes developed before the first world war: Edeleanu's method of solvent extraction and Bergius' discoveries in hydrogenation. Then, in 1925, Fischer and Tropsch published their account of the work they had done on the synthesis of aliphatic hydrocarbons from coal.

Commercial Application

To keep pace with engineering progress after 1920, solvent refining and hydrogenation were introduced commercially but it was found that increasingly drastic refining did not necessarily produce correspondingly improved lubricants. Indeed, heavily solvent refined or what might be called " ultra-refined " oils were found to be decidedly lacking in certain properties and this helped to open the door to chemical additives on a commercial scale in the 1930's.

The issue of patents on additives rose, in the U.S.A., from seven in 1930 to 138 in 1944. This increase was relatively greater than that of all other patents in the same period. In Britain, the issue of additive patents in 1934 was 34, and 56 in 1949.

The need for oils suitable for operation in cold climates was apparently visualised as early as 1879 when a patent application was filed claiming the use of chloroform in mineral oils to render them more fluid at low temperatures.

This was probably an effort to obtain an oil of reduced viscosity at low temperatures rather than oils of low pour point. However, it was soon realised that the use of a pour depressant could possibly reduce or even eliminate refinery dewaxing and 20 patents covering various types of pour depressant were issued in the U.S.A., between 1920 and 1930.

None of these inventions was commercially effective and the so-called " total " dewaxing remained in use until, in 1930, the discovery of the well-known hydrocarbon wax-naphthalene condensate reduced the necessity for excessive dewaxing. Not only does the use of this type of pour depressant effect an economic saving in processing, but the quality of the oil is improved by the retention of wax which promotes high viscosity index and oxidation stability.

Lubricating oil quality was further advanced by the development of viscosity index improvers, giving better cold starting and smaller consumption, which first began to appear about 1928. The first practical VI improver, a polybutene, was offered commercially in 1934 and a steady increase in patent activity followed.

In 1926 the Gleason Works cut the first hypoid gear, the lubricant for which must be capable of withstanding pressures of nearly 200 tons to the square inch and rubbing velocities in the region of 180 m.p.h. These are conditions no mineral oil can withstand without being fortified with an extreme pressure additive.

The additives introduced for this purpose included lead soaps and active sulphur of the type patented as long as 80 years ago. Additives of this nature are still employed and synthetic chemicals have also been developed for the purpose.

The importance of inhibiting lubricating oil oxidation also became apparent in the 1920's and the first patent of this type for transformer oils was filed in 1923. In 1927 a comprehensive study of oxidation inhibitors for highly refined oils was published by Haslam and Frolich, who showed that certain metals commonly encountered in industrial equipment, such as copper and iron, were promotors of oxidation and that nitrogen compounds such as phenyl alphanaphthylamine were effective inhibitors.

Turbine Oil Inhibitor

These additives were used mainly as turbine and transformer oil anti-oxidants, and have also found application in hydraulic, spindle and instrument oils and even in greases. The first commercial turbine oil containing an inhibitor was a white oil marketed in 1929.

It was not until 1935 that oxidation inhibitors were developed for motor oils. Ultra refining, hotter running engines and the introduction of alloy-type bearings led to heavy corrosion problems. A specific instance was the trouble experienced from corrosion of the cadmium-silver bearings fitted to the 1936 Pontiac engine when solvent-extracted oils were used. There has subsequently been an increase in the use of alloyed bearings to withstand growing power output of engines. This is reflected in the rise in patent applications for motor oil anti-oxidants in the U.S.A., from eight to nearly 60 yearly.

DRUGS AND FINE CHEMICALS IN 1949—VII

Development of the Antibiotics

by G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

THE "screening" of substances for therapeutic properties is a long and tedious business and not the least complicated aspect is the induction of standard lesions in experimental animals.

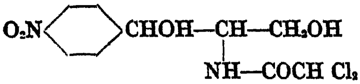
This matter has already been referred to in a recent review in connection with Selye's work on the production of a standard arthritic lesion in rabbits with formalin (THE CHEMICAL AGE, *62*, 261). Rolsen and Rees (*Nature*, 1949, *164*, 351) have devised a means by which a standard tuberculous lesion may be created in rabbits by using the cornea of the eye as a site of infection.

The procedure has been found sufficiently reproducible to use it as a means of screening anti-tuberculous drugs *in vivo*. In particular, streptomycin and PAS, as well as the combination of these two drugs, have been screened. The additive effect of the two drugs is said to have been strikingly confirmed.

Penicillin is, of course, now well-established as a member of the therapeutic armamentarium. Investigations continue on the synthesis and the reader is referred to the series of contributions to the *Journal of the Chemical Society*, during 1949, by A. H. Cook and his colleagues on "Syntheses in the Penicillin Field."

Commercial Synthesis

Chloromycetin, the antibiotic first isolated by Ehrlich *et al.* (*Science*, 1947, *106*, 407) from *Streptomyces venezuelæ* (Ehrlich, *J. Bact.*, 1948; see also Smadel *et al.*, *Science*, 1948, *108*, 160), is the first antibiotic to be synthesised on a commercial scale following its characterisation as D(-)-*threo*-1-nitrophenyl-2-dichloroacetamidopropane-1:3-diol and the synthetic compound has been named "chloramphenicol" and has the structure:



Chloramphenicol has been found especially useful in the treatment of typhoid fever. Cook and Marmion (*Lancet*, 26/11/49, 957) found it terminated the fever in five days and arrested the progress of the disease. This confirms the findings of the American workers and earlier reports in this country.

It is now generally considered the best therapeutic agent for typhoid fever. It may be administered orally. Toxic effects are few and it does not appear to produce resistant strains.

At the moment it appears to have one disadvantage in that it may not sterilise the gut and thus may not avoid relapse or prevent existence of "carriers"; but it is thought that this may later be found to be a question of dosage (*Lancet*, 26/4/49, 1001).

Versatile Substance

Another antibiotic — aureomycin — a metabolic product of *Streptomyces aureofaciens* has been the subject of considerable exploration during 1949.

Discovered by Duggar in 1948 (*New York Acad. Sc.*, 1948, *51*, 177), this yellowish crystalline substance, when in the form of its hydrochloride, has been found to be very versatile and to be effective in inhibiting the growth of both gram-negative and gram-positive bacteria. It has been found particularly effective in the treatment of certain rickettsial and virus infections.

Having a low toxicity, aureomycin, like chloromycetin, may be administered effectively by the oral route (for example, Spink and Yow, *J. Amer. Med. Ass.*, 1949, *141* (14), 964). It has been valuable also in streptomycin and sulpha drug-resistant infections.

Irritation Side-Effect

In some patients, however, there appears to develop considerable nausea accompanied by irritation of the gastro-intestinal tract when the drug is administered. This irritation can be so acute that it has become the practice to administer aluminium hydroxide and other slow-acting antacids simultaneously with the drug to relieve these side-effects.

It has been shown by Waisbren and Hueckel and by Howard (*J. Amer. Med. Ass.*, 1949, *141* (13), 938) that this is an indefensible practice, as the antibiotic is adsorbed on to the alumina with consequent failure to build up the derived serum levels.

According to Lamar (*J. Amer. Med. Ass.*, 1949, *141* (13), 938) these undesirable side-effects were entirely relieved in a small number of patients examined by him by the administration of the antihistamine drug, dramamine, referred to earlier in connection with motion sickness. So effective was this treatment that up to 1000 mg. aureomycin could be administered *per os* every four hours, without discomfort.

Aureomycin has already been found effective, *inter alia,* in such rickettsial diseases as Rocky Mountain Fever, in the virus forms of pneumonia, brucellosis, etc. Its use has met with some success in the treatment of gonorrhœa. Wilcox (*Brit. Med. J.*, 12/11/49) has opened up a new field of investigation by his finding that aureomycin has a marked effect upon the course of human syphilis.

Availability

In the U.S.A., aureomycin has become freely available, but in the U.K. the drug is still costly and scarce. At present it is available to certain hospitals for use in specified conditions only (*Brit. Med. J.*, 19/11/49, 1171; 24/12/49, 1468).

An interesting assessment of these four leading antibiotics now in current use—penicillin G, streptomycin, aureomycin, and chloramphenicol (chloromycetin), has been made by Long and his colleagues (*J. Amer. Med. Ass.*, 1949, *141*, 315).

For each of a type of 12 susceptible infections or diseases the authors indicate the relative effectiveness and relative order of choice of these important chemotherapeutic agents.

Enhanced Accuracy

Methods of titration of certain antibiotics have been critically examined by Valentine and Johns (*Lancet*, 8/12/49, 1038). Recommendations are made for modifying the conditions so that enhanced accuracy is secured in the case of those antibiotics, such as penicillin and aureomycin, which are more active in acid than in alkaline solution.

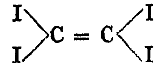
The comprehensive survey of fungistatic substances continues under McGowan's guidance at the I.C.I. Butterwick Research Laboratories.

This group of workers embarked upon their researches in the field as a consequence of the screening of a large number of organic compounds for fungistatic effect (*Annals of Applied Biology*, 1948, *35*(1), 25; 1948, *35*(1), 37; 1949, *36*(2), 250). The most satisfactory effects were obtained in a group of substances containing carbon, hydrogen and oxygen, only, and nearly always possessing an ethylenic bond and especially when a strongly electron-attracting group is attached to the double-bonded carbon atoms.

In such circumstances adjacent methylene groups are rendered reactive, and the substances have acidic hydroxyl derivatives and give phenyl derivatives which are substituted in the meta position. The intensity of biological action was found to be related to the affinity for electrons of the different groups attached to the bond.

The lower halogen and thiocyanofumarates which agreed with the above classification were found to be highly fungistatic, as were derivatives of acetylene dicarboxylic acid, which represents a newly discovered class of fungistat.

Tetraiodoethylene was found to be somewhat anomalous and to be highly fungistatic. It is to be noted that this substance contains only carbon and iodine in the molecule. Tetrachloro- and tetrabromo-ethylene were found not to have a correspondingly high activity against the last fungus.



$$\mathrm{I_2C{=}CI_2}$$

From a study of a series of iodinated acetylenic compounds, it was concluded that the high activity of tetraiodoethylene might be due to the fact that these compounds yield positive halogen, but it is not yet clear whether biological activity is to be ascribed solely to this property.

Grove and McGowan (*Chem. & Ind.*, 17/9/49, 647) in a paper read before the Fine Chemical Group of the Society of Chemical Industry have described the applications of physico-chemical methods in the study of biologically active compounds.

It is impossible to close a review of a year of notable achievements in this field without reference to the publication of a new edition of the British Pharmaceutical Codex, which is the more acceptable for the fact that the last edition was published in 1934. This publication both retains and extends its wide usefulness through a fundamental change in layout.

(*concluded*)

Previous articles in this series appeared in THE CHEMICAL AGE, *Vol.* 62, *pages* 123, 191, 261, 332, 576 *and* 719.

Glaxo Laboratories in Britain

One of the successes of the recent tour of Central and South America made by Sir Harry Jephcott, chairman and managing director of Glaxo Laboratories, Ltd., was the film made by the company to demonstrate its various activities in the United Kingdom. The film gave glimpses of the work at Ulverston (fermentation), Barnard Castle (penicillin), Driffield (milk drying), and at Greenford (research).

Metallurgical Section

3 June 1950

IMPROVED STAINLESS STEEL SMELTING

Oxygen Lancing Reduces Chromium Loss

BY the use of a new technique Sheffield steelmakers have speeded up their method of producing stainless steel, improved its quality, and cut down their consumption of the expensive alloy ferro chromium, which requires the import of chrome ore for its manufacture.

The new process, oxygen lancing, was described last week by the British Iron and Steel Federation. Pure oxygen is blown through a long, thin pipe thrust through the door of an electric arc furnace into the molten steel inside. By regulating the pressure and amount of oxygen blown, and watching carefully the temperature of his furnace, the steelmaker can refine the steel to the composition he wants, losing much less of the valuable chromium content of the stainless steel scrap in his charge than he did before oxygen lancing was adopted.

Previously, large amounts of chromium were thrown out and lumped with the slag, as the methods of manufacture could not prevent it from passing out of the scrap in the charge, into the slag .

As much stainless steel has 18 per cent or more of chromium in its composition, building up the chromium content again by alloy additions was expensive. Alternatively, high frequency induction furnaces could be used in which chromium was not lost. But these are expensive to run, and turn out steel in comparatively small quantities.

The Oxygen Lance

The use of the oxygen lance now enables the steelmaker to keep four-fifths of the chromium in the metal when he is making a stainless steel with 18 per cent chromium, and he can retain all of it if he is making a " rustless " steel with 12 per cent chromium.

Thirty-five thousand tons of stainless steel scrap " arises " in Sheffield in a normal year, and the new process makes it far more economic to use all this.

Oxygen lancing also increases the speed of refining. Ten minutes' oxygen lancing does work which would take half, to three-quarters, of an hour by the old method—and saves electric current. There is a further result in that the polishers declare the steel made in this way " comes up " better and more quickly.

It has taken three years for this process to reach its present stage. Further developments in the works of several stainless steel manufacturers are expected to improve it still more.

A fuller description has been provided in a technical note by Dr. E. Gregory and Mr. W. H. Everard of Edgar Allen and Co., Ltd., of Sheffield, which developed the process under the direction of Mr. Everard.

Recovering Scrap

In the past most of the stainless steel scrap or waste from the manufacture of stainless commodities was almost unusable by companies manufacturing stainless steel solely in arc furnaces. Manufacturers here were faced with an ever increasing tonnage of scrap stainless material containing valuable elements such as chromium and nickel which could only be remelted in comparatively small quantities in high frequency furnaces.

In the arc furnace the electricity used in the melting is conducted to the charge by means of carbon or graphite electrodes. These are lowered to within a small distance above the metallic charge in the furnace so that an arc is formed between the end of each electrode and the metallic charge. The temperature of the electric arc is somewhere in the region of 3000° C., the heat generated constituting the melting medium.

One element in stainless steel which must be under control within a narrow range is carbon and in the chromium-nickel stainless steels it is often desirable to finish with a carbon content less than 0.08 per cent.

In the arc furnace, due to the close proximity of the carbon electrodes to the metallic charge, experience has shown that it is impossible to prevent a pick-up of carbon in the steel during melting and the pick-up is often so great as to render the steel practically unusable.

By the old technique a relatively slow method of removing carbon had to be used, in the course of which chromium was also removed. It was this feature which very severely limited the quantity of stainless steel scrap in the charge.

Briefly, the new technique is as follows: Charges consisting entirely of stainless steel scrap are melted in the furnace with no regard for carbon contamination. When molten, pure oxygen gas is blown into the metal. The oxygen burns or oxidises from the steel such elements as silicon and manganese which all tend to increase the temperature of the molten steel. Subsequently carbon is burnt or oxidises until finally, if desired, as low a figure as 0.05 per cent may be reached, and this without nearly the same loss of chrome.

During the oxygen injection some chromium is oxidised, thereby generating more heat, and this chromium mainly passes into the slag covering the steel. However, at a later stage in the process this chromium can be made to pass back into the molten steel to the extent of about 96 per cent.

At the end of the blowing period the temperature within the furnace cannot be measured, but an estimate is that it is upwards of 2000° C. During the blowing process the pressure of the oxygen gas, its rate of flow and the volume used must be carefully controlled.

This new technique—the oxygen lancing of molten stainless steel charges—is the answer to this country's remelting of many thousands of tons of stainless steel scrap. Moreover, it is claimed that a superior quality of steel is produced. It is claimed that this new technique is one of the most important developments that have taken place in the manufacture of stainless steel since its initial discovery.

The principle of the application of oxygen in this way is not entirely new, but hitherto it has not yielded the present highly satisfactory results.

It has taken about three years for this work to reach its present stage, the result of team-work of the melting, technical and research departments.

Film Record of British Steel Achievements

THE recent decision, announced by the Minister of Supply, to end steel rationing, except for sheets and tinplate, is welcomed by all who recognise the ability of the industry to meet its present requirements. It has come, belatedly, as an incentive to both steel founders and steel users, who have for some time been urging the cessation of the control scheme.

The growth of British steel production in the last 15 years is a story of steady progress. In 1935, production was less than 10 million tons; by 1939 it was 13 million tons and output for the first quarter of 1950 was at the rate of over 16 million tons annually.

Unique Record

No other comparable industry can claim such a record. Steel workers' earnings are 120 per cent higher than in 1938 and prices of products are only 85 per cent more, despite an increase of 148 per cent in the cost of coal and an average rise for all articles of 142 per cent.

Some of these facts are recalled by the British Iron and Steel Federation in the film "Great Achievement," which it has recently completed, a summary of which is published in the May issue of its monthly bulletin, *Steel News*. The continued rapid growth of the industry is evidenced

A metallurgist applies a creep test to record the behaviour of a heat resisting steel under stress for a long period by the comprehensive development plans now being implemented throughout Britain. New works are rising on the salt marshes in South Wales, at Middlesbrough and Sheffield, in Lincolnshire and, elsewhere, old plant is being replaced by new.

The story the film has to tell is of vital interest to British industry as a whole, which relies substantially on steel for a large measure of its prosperity. (Nearly half our exports are of steel or of materials using steel). An idea of the complex structure of the industry is given and of how competing firms co-operate through the BISF to organise research, training, information and other services.

Fuel Economy

Recognition is made of the work of chemists and metallurgists in individual firms and in central research laboratories. One of the best examples of their work is in the field of fuel economy; the amount of coal needed to produce a ton of finished steel has been reduced from over 60 cwt. in the 1920's to 37 cwt. to-day.

The problems—particularly of the smaller firms—presented by training will be eased by the information contained in a " pattern " scheme which has been devised for the industry. Area training officers have been appointed to help companies, and training centres, where boys and girls receive instruction, are shown in the film.

One of the most important joint activities of iron and steel concerns is, of course, to ensure regular supplies of ore from abroad. Part of this activity is illustrated by scenes showing a modern plant loading ore on to a ship at Pepel, Sierra Leone. Large quantities of iron ore come from Marampa in the British territory of Sierra Leone. This deposit will last another three or four years, but 70 miles away there are known to be vast quantities not yet exploited.

Joint exploration with the French for ore is in progress in Conakry, West Africa. Roads are being driven into virgin land, where waterfalls will supply hydro-electric power.

The transport of some 60-70 million tons of steel and raw materials each year has been studied by the industry as a common problem, and the improved designs of unloaders, wagons, etc., have made possible greater efficiency.

The health of the worker is rightly regarded as vitally important and the latest medical equipment is now available for treatment. There have been cases of men returning to work after an injury that only a few decades ago would have incapacitated them permanently.

Magnetite in the Shetlands

REPORTS from Shetland state that the magnetite ore deposits at Sullom are " very encouraging." This research work was undertaken by a London group, to prove the extent and quality of the known deposits in the area. Anticipated yield is believed to be in the region of 70 per cent magnetite. Further prospecting is being done on magnetite and hematite outcrops in adjacent parts of the Shetlands.

The commercial value of these deposits cannot be accurately determined until a full survey of all the conditions has been made. Modern handling methods may offset to some extent the problem represented by the distance from processing centres. Raasay, off the West Coast, is one of the islands known to have isolated deposits. They have been worked spasmodically with POW labour.

Specially hardened steel, used for cutting tools, etc., is produced by this electric high-frequency induction furnace. Other numerous activities of firms producing or consuming steel are shown in the film

HEAT-RESISTANCE OF ZIRCONIUM ALLOYS

Few Satisfactory for High-Temperature Application

DETERMINATION of the suitability of zirconium alloys for high-temperature applications and a general survey of 23 zirconium-rich alloy systems form the subject of the U.S. Bureau of Mines report (No. 4658), which continues its series of investigations of the rare metals. Previous reports dealt with titanium and thallium (THE CHEMICAL AGE, 62, 473 and 685).

The basic process for producing zirconium is similar to that developed for producing ductile titanium metal and consists essentially of reducing the chloride by means of molten magnesium. The Northwest Electrodevelopment Laboratory at Albany, Oregon, has produced some thousand pounds of ductile metal in this manner and has a pilot plant producing over 300 lb. of metal per week.

Alloying with Graphite

Alloys were prepared by melting zirconium and the best available grade of alloying element in graphite, with suitable provision to prevent oxidation. The ingots were quartered longitudinally and sheet-swaged at 850° C. to ⅜-in. diameter rod. Two of these rods were sent to Wright Field for determining tensile properties at room-temperature and 1200° F.

The remaining two sections were used for metallographic, hardness, heat-treatment and heat resistance studies and the salient points of these investigations summarised in a table. Heat resistance studies indicated that a few of the alloys were satisfactory for service at 1200° F., and one group (Zr-Cu-X) was found to have some application at 1400° F.

Heat treatment and metallographic studies of most of these alloys indicated that the equilibrium diagram for the zirconium-rich alloys probably resembled the $Fe\text{-}Fe_3\text{-}C$ system.

The affinity of zirconium for oxygen and nitrogen at elevated temperatures precluded the melting and heat-treatment of the alloys in air. All alloys were, therefore, heat-treated either in vacuum or in a helium atmosphere.

Zirconium, when molten, reacts with virtually all known crucible materials, but can be melted satisfactorily in graphite, which only causes contamination with carbon, usually to the extent of 0.15 to 0.25 per cent. The rôle of carbon in zirconium had little influence on the mechanical properties; though the effect of the formation of mixed carbides in systems containing such elements as vanadium, titanium, columbium or tantalum might be considerably greater than that of zirconium alone.

Melting was carried out in crucibles of better grade graphite by compacting mixtures of zirconium sponge and the requisite amount of alloying material. A high vacuum was employed to assist in the removal of gaseous impurities from the alloy agents and such materials as Mg or $MgCl_2$ present in the zirconium-sponge.

Results of the whole investigations were tabulated to show the preparation, composition, metallography, forgeability, heat-resistance, and tensile properties of the 23 alloys.

The primary purpose of the survey, which is called preliminary only, was the determination of the heat-resistance of zirconium alloys, as it was realised from the beginning that, in spite of a high melting point, the metal itself offered little hope of being serviceable even at medium temperatures.

Aluminium as Alloy

It was hoped that the addition of other metals would stabilise the oxide coatings and increase the hot strength of zirconium. Some improvement was noted in certain cases, but it cannot be said that any of the alloys studied were satisfactory for high temperature applications.

Aluminium was found to be by far the best alloying element for increasing the hot yield strength, but it did not produce any zirconium alloys with outstanding properties at 1200°F.

The groundwork laid in this survey of zirconium alloys will serve as a guide for a further study of the more promising systems. More emphasis will have to be placed in future on equilibrium diagrams, physical properties, and chemical corrosion resistance.

Steel Order Published

The Control of Iron and Steel (No. 79) Order, S.I. 1950, No. 829 became effective on May 27 (THE CHEMICAL AGE, 62, 773, 778.) Sheet, tinplate, terneplate and blackplate are the only materials still controlled. Pig iron and scrap remain subject to licence control. Copies of the Order are available from H.M. Stationery Office.

STEEL PRODUCTION AND TECHNIQUES

Visits to U.S.A. Reveal Some Valuable Lessons

THE prospect that useful advances in workshop practice and general technology would accrue from the recent contacts between U.K. and U.S. steel interests is confirmed by reports from two sources.

One is an interim survey by the Anglo-American Joint Council on Productivity, describing achievements since the report of the British team which visited the U.S.A. was published last September. The other is the news that the recent visit to Canada and the U.S.A. of the director of the British Iron and Steel Research Association and Mr. M. W. Thring, head of the association's physics department, is to provide a valuable report of their findings, to be published shortly.

Commenting on these, the report claims that any visitor must be impressed by the wealth of new technical achievements in the U.S.A. in recent years, most of which have occurred in industries with strong research facilities, such as the electrical, plastics, motor and printing industries.

American firms, it is claimed, like to be considered progressive and the American public is constantly demanding change. The result is that, although many wrong and costly steps are taken, progress in general is real and rapid.

British Research

The view is offered, however, that research in the iron and steel companies of the U.S.A. and Canada is less than could be expected in the British industry. The extensive authority and initiative of the chief metallurgists and chief engineers, backed by their well equipped drawing offices, are a leading contribution to the considerable advances made. Other factors are the pressure exerted by the suppliers of raw materials and user industries, and the vast researches carried out by Government laboratories, or financed by the Government, in universities and commercial research institutes.

A valuable lesson was learned from the development work in ore beneficiation, made necessary by the imminent exhaustion of the Mesabi reserves. It has provided data for some pioneer work in the treatment of British ores.

American experience in using carbon hearths in blast furnaces has shown some mistakes in design, and their trials on the use of oxygen in these furnaces have shown the severe limitations of the process. Results on the use of oxygen in the open hearth furnaces, however, fully confirm experiences here, and the application has proceeded in parallel in the two countries.

Extensive studies were made of continuous casting in America, both in the non-ferrous and ferrous industries. The technical details brought back should accelerate developments in this country. The Americans are said to be using very rapid methods of analysis for use in melting shops.

Electrolytic Productions

The production of electrolytic tinplate is very large and the technical developments stimulated by the existence of three rival processes have been important. New and increasing use is being made of hot dipped aluminium, electrolytic copper, electrolytic zinc, and stainless clad steels.

Nothing outstanding was seen of new steels, except the transformer sheet and stainless steels.

The standard of fundamental scientific research of interest to metallurgists has risen considerably since before the war, largely due to the growth of three or four strong university schools and to the interest in fundamental metallurgical research of user industries.

The higher productivity of the U.S. steel industry is considered to be greatly aided by the purity of its raw materials—a diminishing advantage—and by the size of its works and plant. Fewer men appear to be engaged per unit of machinery. the extreme case being quoted of an open hearth furnace tapping 600 short tons and operated by three men.

Little co-operative research was observed but there is extensive use made of commercial research institutes, some very large and influential. Britain's need to match her existing research facilities of steel companies and research associations by increasing pilot plant work is one of the most important impressions gained by the director of the BISRA and Mr. Thring. That would call for corresponding activity by managements to resolve the commercial problems raised by technical changes.

It is of interest, however, to record some of the main benefits which have already accrued as a result of the British "productivity" team's visit to the U.S.A.

Output has increased sufficiently to enable the industry to decide not to pass on to the public the increased rail freight charges.

The 80 firms—representing 90 per cent of the industry—in the British Steel Founders' Association are offering reduced prices for larger orders of standard castings, enabling foundries to work on "longer runs."

Two "productivity" conferences have been organised within the industry in six months, and a third is planned for about the end of the year.

At a recent conference arranged jointly by the British Steel Founders' Association and the industry's two principal unions, Mr. F. Rowe, chairman of the association, said that a striking change was evident in the attitude of employers and workers to productivity. At a technical convention held recently, representatives of founding companies referred to savings in time, material, and power consumption and in man-hours a ton produced, which already showed substantial improvements in productivity.

Mr. John Wigglesworth, secretary of the Iron, Steel, and Metal Dressers' Trade Society, said that there was now a better feeling between workmen and employers than he had ever known. Mr. R. Casasola, of the Amalgamated Union of Foundry Workers, said that new techniques were going to break down a number of what used to be skilled jobs into easier processes, some less skilled, some requiring new kinds of skill with machines.

Non-Ferrous Metals Production and Stocks

LEVELS of Government and consumers' stocks of non-ferrous metals at the end of April showed marked increases in nearly all instances, compared with the corresponding month last year. Among the largest increases (the 1949 figure is shown in brackets) were: zinc in concentrates 35,551 long tons (14,723), imported virgin lead 56,416 (33,147), English refined lead 5061 (793). Production increases, compared with April 1949, were recorded for slab zinc, lead in concentrates and English refined lead.

UNWROUGHT COPPER

	Long Tons Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers'	34,663	81,219
Imports	19,652	15,373
PRODUCTION:		
Primary	—	7,705
Secondary	1,722*	5,282
CONSUMPTION:		
Primary	7,956	22,884
Secondary	—	13,564
Exports	2,717†	8
CLOSING STOCKS:		
Govt. and consumers'	46,813	81,089

* Rough Copper.

† Includes 876 tons of rough copper despatched to Belgium and 1,841 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	20,781 long tons
Alloyed copper products	21,951 ,, ,,
Copper sulphate	4,608 ,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	29,248	45,136
Imports	12,653	17,521
PRODUCTION:		
Virgin and remelted	—	5,353
CONSUMPTION:		
Virgin (incl. debased)	6,345	17,494
Remelted and scrap	—	6,308*
Exports and Re-export	—	2
CLOSING STOCKS:		
Govt. and consumers'	35,551	46,594

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	59,169	5,420	—
Other stocks ...	108	—	—	—
IMPORTS	—	5,549	—	43
PRODUCTION ...	173	—	5,547	—
CONSUMPTION ...	208	9,556	5,906	7,740
EXPORTS	—	38	—	—
CLOSING STOCKS:				
Govt. and consumers'	—	56,416	5,061	—
Other stocks ...	78	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,130
IMPORTS	260*
PRODUCTION	—
CONSUMPTION	1,714
EXPORTS AND RE-EXPORTS	518

* From January, 1950, includes imports of soft solder; if any.

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	360
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	217

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	42.85

FIRE HAZARDS OF MAGNESIUM ALLOYS

*Storage and Prevention Precautions**

SOLID magnesium ingots and castings are not readily ignited, but magnesium and magnesium alloys of moderate fineness, such as the turnings (swarf) which result from machining, can be readily raised to ignition temperature and ignited by, for instance, friction from a blunt cutting tool. Fires in this material cannot be easily extinguished by the more common methods of fire fighting. Dust and powder, although highly flammable, are not produced in appreciable quantities in machining, and do not constitute a special hazard in machine shops.

Magnesium possesses a great affinity for oxygen. It reacts with water, and liberates hydrogen. The reaction, although very slow at normal temperatures, increases with the rise in temperature until, when the metal is in a molten state, the reaction is very rapid and the hydrogen produced may form, in conjunction with air, an explosive mixture. Sand, and silica-bearing materials and ferric oxide, —present in iron scale—react violently with magnesium at high temperatures.

The risk and ease of ignition of magnesium swarf increases with the fineness of the swarf. High speed fine finishing cuts produce very fine swarf, and if the cutting tools are not sharp, heating and ignition may take place.

Machining Precautions

Water or water emulsions should not be used in machining operations. If dry machining is not practicable a cutting oil, preferably mineral, should be used. Where an oil subject to spontaneous heating is used, the contaminated swarf should be handled and stored very carefully, although the thermal conductivity of the magnesium tends to lessen the danger of spontaneous ignition.

Magnesium should be stored in a dry place away from any building in which machining is carried on. Stocks of magnesium in the easily ignitable forms, should be kept well separated from stocks of magnesium in forms less easily ignited.

Quantities of magnesium in any pile should be kept to a minimum. Gangways equal in width to the height of the pile with a minimum of 5 ft. should be provided between piles, and between magnesium and other combustible materials. Swarf should for preference be packed in metal drums, which should have watertight lids. Each drum should be separated from its neighbour so that, if a fire should occur, other drums may be cooled while the affected drums are burning, or being dealt with by other means. Large quantities of swarf should be avoided, as far as possible, by melting down into solid ingots.

Magnesium, when dry or oily, burns quietly and produces no toxic smoke or gases. This is advantageous in that fire fighting operations are facilitated and unburnt castings or material may be removed from the burning mass. When wet, the swarf burns violently. Minor explosions may constantly occur and the fire cannot be approached. Should a swarf fire develop on a concrete floor a certain amount of "spattering" will take place.

Good Housekeeping

Since the extinguishment of magnesium fires may be difficult, every effort should be made to prevent them. Strong emphasis should be place on good housekeeping wherever magnesium is handled or stored. Combustible materials in proximity and having an ingition temperature lower than that of magnesium should be kept down to a minimum.

Good housekeeping should include not only the orderly arrangement of stacks of magnesium, with proper gangways, but also the general cleanliness of machines and of floors, walls, overhead beams and ledges, benches and all other areas where fine particles of magnesium may collect. Waste magnesium should not be allowed to collect in, around or underneath machines but should be swept up and removed at frequent intervals.

Magnesium swarf and turnings, *i.e.*, the waste products referred to in the previous paragraph, should be placed in plainly identifiable covered metal containers, and these should be removed from the buildings in which the machining is carried on to a properly arranged storage place as soon as they become filled, and certainly at the end of each day.

Magnesium, having a great affinity for oxygen, can utilise the oxygen in water or steam for the purpose of combustion. In this way the oxygen contained in carbon dioxide, in sodium bicarbonate (one of the contents of most "dry powder" extinguishers), and in the water base of foam can also be used by magnesium for the purpose of combustion.

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* Re-published from the April issue, page 64, of the *F.P.A. Journal*, the organ of the Fire Protection Association.

Magnesium can also burn in an atmosphere of chlorine, combining with that element to form a chloride. Carbon tetrachloride should not therefore be used as an extinguishing agent; as already stated, sand and silica-bearing materials, under conditions of intense heat, react violently with magnesium as does also ferric oxide.

Undesirable Extinguishing Agents

The foregoing makes the general use of water, foam and carbon dioxide fire extinguishing agents undesirable, but it does not mean that water cannot be used in sprinkler installations or by the fire brigade, using proper precautions, by means of large hose streams, nor need it prevent the use of sand and silica-bearing materials on very small fires.

For dealing with the small fires which are likely to be common in the machining of magnesium, supplies of extinguishing agents, which are chemically inert to burning magnesium, should be kept readily available at all points where machining or other mechanical operations on magnesium are performed, and also where magnesium is heated or melted or is kept in a form or under conditions which permit of easy ignition. A small magnesium fire, which has not developed enough heat appreciably to raise the temperature of the unburned metal and the surrounding area, can be extinguished by almost any thermally conductive metal which is itself relatively non-combustible and which does not contain freely available water, chlorine or oxygen.

Small magnesium fires should first be covered with an extinguishing agent and then, so far as is possible, any adjacent unburnt material should be removed from the immediate vicinity of the fire. As the fire grows and the rate of burning increases the number of extinguishing agents which are effective decrease, so that, by the time a fire reaches large proportions, the only suitable medium may be water, in spite of its disadvantages.

Suitable extinguishing agents for use on small magnesium fires are: Asbestos blanket for swarf fires on or around machines; dry sand, dry cast iron filings. These abrasives should be used only where there is no danger of machinery being damaged. Non-abrasives include powdered talc, hard pitch, powdered graphite, magnesium oxide and asbestos, and can be used without damaging effects to machinery. All these materials should be gently shovelled on to the fire and spread so that the burning area is completely covered. With large fires, the amount of extinguishing materials needed may be very great.

Even though the application of water to burning magnesium accelerates the burning and may be accompanied by explosive reaction, automatic sprinkler protection is of value in the control of such fires. Water from sprinklers may normally be applied to burning magnesium without structural damage by explosion or violent reaction, although explosions capable of doing structural damage may occur when molten magnesium in quantity flows into an accumulation of water. With proper floor drainage the likelihood of such explosions can be greatly reduced.

In spite of the reaction of burning magnesium with water, tests which have been carried out indicate that in certain circumstances water can be applied effectively to large magnesium fires. Several techniques have been developed, all of them based on the principle of applying water at a greater rate than the reaction rate between it and magnesium.

By this means magnesium is cooled below its ignition temperature. In the process explosions will occur, but, except in the circumstance referred to earlier where large quantities of molten magnesium are allowed to flow into accumulations of water, severe structural damage should not result, although, of course, the hazard from the fire fighters' point of view must be borne in mind.

Before attacking a large magnesium fire with hoses the situation should be carefully assessed. The quantity and the form of the magnesium, the conditions of storage, the building construction and the character and extent of the fire will be among the factors to be considered in deciding upon a course of action to bring the fire under control.

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OVERSEAS CHEMISTRY AND INDUSTRY

INDIA'S PENICILLIN POLICY

Controlled Distribution and Manufacture

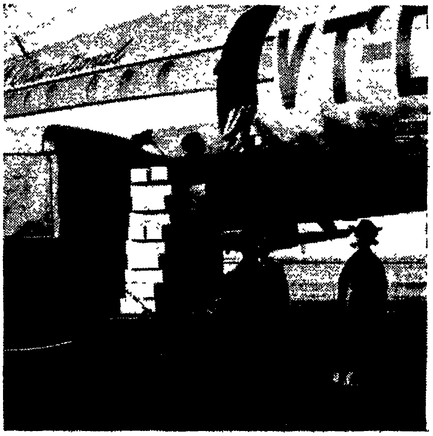
TEN per cent of the entire penicillin stocks held by importers in Bombay has been requisitioned by the Government of Bombay.

Mr. D. Desai, Civil Supplies Minister, Government of Bombay, said that if this quantity did not suffice to meet all the requirements of Bombay, the Government would commandeer the rest of the stocks immediately and, if more were needed, it would import it by air from England. While there was any chance of black market transactions the Government would not allow free trade by private dealers. It would continue to sell penicillin through its own agency at least for another six months.

This step has been taken because of a temporary shortage of penicillin in India. The Controllers at Bombay, Calcutta and Madras are issuing licences freely for the import of penicillin from dollar and soft currency countries. Since January 1 this year, licences have been issued for the import of Rs.4 million worth of penicillin from Canada and the U.S.A. and Rs. 7,777,000 worth from soft currency areas.

The Government has also decided to liberalise the import of para-amino sicilicic acid, insulin and certain anti-leprosy drugs, sulpha drugs and arsenicals from soft currency countries.

More or less concurrently, an agreement has been signed between the Government of India and a Stockholm penicillin producer for technical assistance in the establishment of a factory for the manufacture of penicillin and sulpha drugs in India. The factory, to be sited in Bombay, is expected to be completed by the end of 1951-52. It should produce 100,000 mega units per month in the first six months and finally some 3600 billion units per year.



Part of a consignment of 15 *tons of penicillin, manufactured by Glaxo Laboratories, Ltd., and worth about* £250,000, *being loaded on to an Air India Constellation, en route for Bombay. It was one of the largest quantities of the drug flown from Britain*

Plastics Development in Madras

MR. G. N. IYER, a plastics expert, who was formerly hon. secretary of the All India Plastic Manufacturers' Association, is now on a visit to Madras in connection with the starting of the first plastics factory in Madras by private enterprise. The proposed factory is estimated to cost Rs.500,000, with an expansion plan to meet the entire requirements of South India which is estimated at about Rs.5 million.

The annual production of plastic material in 68 factories in India, Mr. Iyer states, is worth about Rs.7 crores. About 20 per cent of the current production is being exported, but in view of the increasing demand for Indian plastics from Middle East countries, this may shortly increase to 30 per cent.

Polystyrene, the main raw material, is now being imported from America to the value of Rs.3.4 million worth annually.

At the third annual conference of the All India Plastic Manufacturers' Association, held recently in Calcutta, a resolution was adopted urging the Government of India to allocate a greater quota of foreign exchange for the import of essential plastics raw materials. India had to depend almost entirely upon foreign countries for the supply of raw materials.

AMERICAN CHEMICAL NOTEBOOK

FROM OUR NEW YORK CORRESPONDENT

SUSTAINED demand for plastics materials especially the thermoplastics, vinyl resins, polystyrene and polyethylene, has helped to retain U.S. production of chemical materials at a high level during the first quarter of this year. The U.S. Department of Commerce, which reports this, records exceptionally high production of sulphuric acid in February and anticipates that the current quarter will show increased output of most chemical supplies.

* * *

THE preparation of ACTH in a form approximately 180 times more active than the standard material is reported by chemists of the Armour Research Laboratories, Chicago. They anticipate they will be able to isolate the hormone in a completely pure form in the next few months. Two new forms, Adactar and Duractar, which greatly reduce the frequency of dosage may produce large economies in the use of ACTH.

* * *

THE microscopic organism called *Botulinus,* potentially the most lethal of food-poisoning organisms, can be killed in food products by minute amounts of antibiotic subtilin. Dr. A. A. Anderson (U.S. Department of Agriculture) has described to the Society of American Bacteriologists experiments in which subtilin, bacterially produced, destroyed botulinus spores in conditions in which they would otherwise have multiplied rapidly.

* * *

CLAIMS that differences as " small as 1/30th of one-billionth of an ounce " can be recorded by a new balance, were made in a report to the Virginia Academy of Sciences by Dr. Jesse W. Beams. The apparatus, which involves a magnetic balance working in a vacuum, is suitable for studies in atomic science.

* * *

A SHARP increase in duties on imported lead to protect domestic producers has been recommended by the American lead industry. The duty on lead in bullion and metal would be raised from 1.06 cents to over 3 cents a pound. Imports in 1949 totalled 399,950 metric tons and domestic production was 404,000 tons.

INGOTS of titanium weighing 500 lb. are now being produced, while some of 1000 lb. are likely to be manufactured shortly, according to a report to the American Institute of Chemists by Alex Stewart, director of research of the National Lead Company. Titanium alloys of chromium, vanadium and nitrogen are finding increased applications. Electrolytic methods of production are being studied to reduce costs and more purified forms of the metal are being sought.

* * *

THE Standard Oil Company of New York is to invest $12 million in the capital stock of a new Italian refining corporation. Half the stock will be acquired by the Standard company, the remainder being held by the ANIC, an organisation in which the Italian Government has a large interest. Of the American investment, $10 million will go to purchase half interests in existing ANIC refineries at Bari and Leghorn.

Canada's Chemical Totals

THE production of Canada's chemical and allied industries in 1948 was the highest attained in any peacetime year, according to the Dominion Bureau of Statistics. The year's value totalled $580 million, compared with $450 million in 1947, a gain of 29 per cent. About one-half of this, however, was due to the inclusion for the first time of the vegetable oils industry.

Higher output values were recorded by all industries in 1948. Increases included these: coal tar distillation, 31.3 per cent, to $8,007,000; heavy chemicals, 19 per cent, to $70,600,000; compressed gases, 17.8 per cent, to $11,314,000; fertilisers, 8.8 per cent, to $63,986,000; medicinal chemicals and pharmaceuticals, 2 per cent, to $71,714,000; paints and varnishes, 16.2 per cent, to $81,279,000; soaps and washing compounds, 27 per cent, to $67,587,000; inks, 18 per cent, to $8,288,000; vegetable oils, 67 per cent, to $63,673,000; adhesives, 16.8 per cent, to $8,660,000; primary plastics 39.5 per cent, to $16,441,000.

There were 1026 factories at work in 1948, employing 39,549 operatives. Cost of materials used in 1948 was $293,041,000 ($205,541,000 in 1947).

Technical Publications

DETAILED advice on laboratory design, installation and layout is among the useful features in the newly issued catalogue (No. 527) of A. Gallenkamp & Co., Ltd. An informative section is devoted to an abridged list, with numerous illustrations, of the many industrial firms and educational and research institutions having laboratories equipped by Gallenkamp. The firm's wide range of laboratory fittings and accessories is listed and exhaustively described and illustrated in this 96-page catalogue. It has an efficient index.

* * *

RUBBER and ebonite linings and coverings for tanks, castings, pipes and other metal fittings used in the storage and conveyance of corrosive liquors, and the extraction of chemical fumes and slurries are described in its new leaflet (A.818) issued by Redfern's Rubber Works, Ltd., Hyde, Cheshire. A standard range of buckets, jugs, scoops, ladles and funnels made of laminated rubber and ebonite is described in the company's leaflet A.817. These utensils provide a safe means of handling a wide range of acids, bases, salts and organic solutions, at temperatures up to 100° C.

* * *

TYPICAL of the sequence of events which has led to significant growth in chemical industries is the history over the past 25 years of Croda, Ltd., Goole, Yorks, recounted in an attractive commemorative booklet just issued. The company's beginning was not portentious, its primary activity being the extraction of wool grease from sudcake made in the Bradford wool scouring mills, a process which quickly proved uneconomical and was abandoned. Now the company is one of the leading wool-grease refiners and manufacturers of wool-grease derivatives in the world, its many products including lanolin—the manufacture of which was previously almost solely in the hands of Germany—rust preventives, and wool wax alcohols. The growth of production of a great range of wool recovery materials and important industrial materials is now interestingly recorded.

* * *

THE increasing number of insecticides, fungicides, and related preparations being put on the market, and the toxicity of many of them, lends particular interest to a chart in booklet form which has been prepared and issued by the Association of British Insecticide Manufacturers. This outlines the provisions of the Pharmacy & Poisons Act 1933 and the Poison Rules 1949, to show specially their effect on sales of these preparations by the manufacturers, wholesalers and retailers. It sets out clearly such requirements as special labelling, persons authorised to sell, and regulations governing storing in the case of certain substances.

* * *

ALUMINIUM has a long association with the chemical industry because of its low catalytic activity, high thermal conductivity and because its compounds are non-toxic and colourless and do not contaminate products handled. These and many other industrial applications are described in "British Aluminium Applied"; a new illustrated publication now available from The British Aluminium Co., Ltd. A brief history of the company and development of the industry is given, and there is also a useful list of the company's publications already issued or in preparation.

* * *

CHARACTERISTICS, specifications and formulae of waxes and emulsifying agents are given in a new series of information sheets issued in loose-leaf folder form by the Abril Corporation (Great Britain) Ltd. The English text of a paper on "The Synthetic Waxes" delivered by Leo Ivanovszky to the Centre du Perfectionnement Technique, Maison de la Chimie, Paris, last year, is reprinted from *The Oil and Colour Trades Journal.*

* * *

COLLATION from world-wide sources of information concerning antimalarials generally, especially quinine and cinchona products, is the function of the London Cinchona Bureau, whose latest publications are a booklet on "The Use of Quinine to Ensure a Normal and Easy Parturition," and a paper on the "Reduction of the Number of Relapses in Malaria by Treatment with Quinine and Pamaquin," translated from the Dutch by Dr. Ch. W. F. Winikel (Fellow of the Institute of Tropical Hygiene, Amsterdam).

Change of Address

The works of Merz Patents, Ltd., consultant engineers and designers of solvent extraction and edible oil refining plants, has been moved from Burton-on-Trent to 34 The Boulevard, Wylde Green, Sutton Coldfield. (Telephone: Erdington 5331).

The Chemist's Bookshelf

Post-Graduate Lectures. Sir Lawrence Bragg and H. J. Emeléus. Cambridge. W. Heffer & Sons, Ltd. Pp. 99. 12s. 6d.

The annual post-graduate lectures sponsored by the Oil and Colour Chemists' Association are now well established. Equally well established, and equally to be welcomed, is the practice of publishing them. Chemical readers have come to expect that they will thus be presented periodically with an outline by an authority on some branch of chemistry in which development has been rapid and vital, and of which, in consequence, all active chemists should have some knowledge. The present volume contains the lectures delivered in the years 1947 and 1948.

The 1948 lectures, delivered by Sir Lawrence Bragg are concerned with a review of recent advances in X-ray analysis. In the first of the three lectures an outline of the fundamental principles underlying Fourier analysis is given. Illustrations chosen from a variety of inorganic substances are used to show how the geometrical and stereochemical information derived from other sources assists the X-ray analyst to arrive at reasonable structures for the substances analysed by X-ray methods.

In the second lecture structures which are not ideally perfect are considered. The ways in which their non-ideal nature affects, first of all, the optical measurements, and secondly, the calculations from these are illustrated by reference to alloy structures. Through this, an introduction is given to the body of knowledge which X-ray analysis has provided to enable valuable progress to be made towards the relation of structure to properties in this field.

The third lecture discusses the peculiar difficulties which arise when applying X-ray methods to the field of organic structures. Numerous examples are given of the successful use of X-rays to obtain a fuller understanding of the structures of complex organic molecules such as the sugars and the sterols, and of how, indeed, in some cases such as the phthalocyanins, it has been possible to deduce the structure completely. An introduction is given to the fascinating and important work on the precise measurement of bond lengths, while there is also a valuable indication of some of the problems which still largely await solution, as, for example, in investigations on the proteins.

The 1948 lectures by Prof. Emeléus deal with the impact of radioactivity on inorganic chemistry. The first lecture provides an historical survey of the chemistry substances, from the first observation, by Becquerel, in 1896, of natural radioactive phenomena in potassium uranyl sulphate, through the investigations of Rutherford and his school on artificial disintegration, to the more recent discoveries of artificial radioactivity, nuclear fission, and the emergence of the post-uranium elements.

The second lecture described a number of the experimental requirements which have to be met in the study of radioactive materials. Problems of measurement and of manipulation both introduce difficulties which are not familiar in other branches of chemistry, and which have, in many cases, been surmounted by most ingenious devices and procedures.

The third lecture outlines those applications of radioactive substances which are of particular interest to chemists, that is, broadly speaking, the two fields of radiation chemistry or the study of the effects of radiation on chemical processes, and tracer chemistry or the use of radioactive atoms as labelled entities for the elucidation of chemical phenomena. In the course of this some indication is given of the methods used for the production and segregation of radioactive isotopes.

Both of these series of lectures were delivered by scientists whose reputation is assured, not only for their part in advancing knowledge in their chosen fields, but also for their ability to expound their subject. If the reviewer must sound one note of regret, it is in respect of slowness of publication. Particularly in the field covered by the second series, published developments have been so extensive since the lectures were delivered that one wonders whether there would not be some alteration in their content if they were re-delivered at the present time. Apart from this reservation, however, the book is valuable, interesting and topical.

• HOME •

Student Guests of Textile Conference

At the annual conference of the Textile Institute, at Cheltenham (June 6 to June 9) nine students from technical colleges and works in England and Scotland will occupy special places, awarded by the institute for the third year and covering the cost of accommodation, conference fees and other expenses to a maximum value of £10.

Zinc Prices Twice Increased

The price of good ordinary brand zinc was raised by £4 a ton from £107 10s. to £111 10s., delivered, as from May 30. This was the second increase within a week, the previous rise being £4 a ton, announced on May 25. Zinc oxide prices were increased accordingly by £3 10s. a ton for two-ton lots. New rates are: Red Seal £105; Green Seal £106 10s.; White Seal £107 10s.

Non-Ferrous Scrap Metal Statistics

Stocks of non-ferrous scrap metals held by the Ministry of Supply Directorate of Disposals, available for disposal at the end of the first four months of the year were lower on April 30 than at the end of 1949, with the exception of ingots, in which there was no change. Totals (in tons) were: QF cases 3251; SAA cases 4857; copper, copper alloy 6339; lead 1722; zinc, zinc alloy 1415; other grades 11,316. Value of the 23,056 tons sold was approximately £1,728,782.

Textile Firm's Anniversary

This year commemorates the 125th anniversary of Samuel Heap & Son, Ltd., dyers and finishers, Caldershaw, Rochdale. About 1870, the firm secured the first French raising machine and introduced the flannelette trade to Britain. As trade increased, the Brookside, Spotland Bridge and Healey Hall Mills were purchased. The Boarshaw Raising and Finishing Co., Ltd., Boarshaw Mill, Middleton, was acquired in 1925. The company now specialises in the dyeing and finishing of rayon, handling all cloths, and in dimensionally stabilised finishes.

Wetting Agent Improves Concrete

An interesting application of the Shell wetting agent, Teepol, is being found during the construction of the Afon Claerwen Dam, Rhyader, which will form part of the Elan Valley reservoirs which provide water for the City of Birmingham from the Welsh mountains. The aggregate, which was mainly crushed stone, produced a harsh concrete. The addition to the mixing water of 0.06 per cent by weight of cement of Teepol is reported to have greatly improved the workability, reduced the tendency of the concrete to segregate and materially helped the compaction.

Sodium Cyanide on a Rubbish Dump

Police have been searching all rubbish dumps in the Black Country following the discovery, on May 26, on a dump at Bilston, Staffordshire, of several five-gallon drums containing enough sodium cyanide to wipe out the entire population of a city. The discovery followed the recent discovery that enough cyanide to kill about 10,000 people had been stolen from a metal hardening shop at Tipton.

A Widnes Chemical Centenary

The centenary of the establishment of the chemical industry in Widnes is to be celebrated this month at a luncheon, to be attended by civic personalities and prominent figures in the chemical industry, and the staging of a fete, which 15.000 people are expected to attend. The celebrations are being planned by the board of I.C.I., Ltd., whose 4000 employees at the Widnes works of the General Chemical Division, and their families and pensioners of the company, will take part.

Planning the Scottish Oil Pipeline

Grangemouth Town Council and the Anglo-Iranian Oil Co., Ltd., have approved a new approach route through the town for the pipe line to deliver oil from tankers in Loch Long. The council earlier opposed the original route which threatened to prevent development of ground earmarked for housing—for the additional workers demanded by the expansion of the oil projects locally. The pipeline project is expected to employ several hundred workers and to cost approximately £800,000.

Metal Grinding Regulations

The main effect of the new regulations governing the grinding of metals, which come into force on June 1 (HMSO 2d.), is that the application to a particular room of some of the exemptions in the 1925 Act will in future depend upon how long certain work is carried on in that room, and not, as hitherto, upon how long a particular individual is employed on that work in the room. In addition to other minor amendments it is also specified which of the provisions of the 1925 Regulations are intended to be in addition to, and which in substitution for, certain provisions of the Factories Act, 1937.

• PERSONAL •

THE British Iron and Steel Research Association announces that Mr. E. T. Judge, director of Dorman, Long & Co., Ltd., has retired from the chairmanship of the association's Plant Engineering Panel, in conformity with the policy of periodical retirement of all committee members. During his term as chairman, since 1948, the division has completed important investigations on steel works layout, traffic analysis and control, the design of steel works cranes, the charging of open hearth furnaces and many other subjects. Mr. J. F. R. Jones, chief constructional engineer at John Summers & Sons, Ltd., succeeds Mr. Judge as chairman of the panel.

Mr. Basil Robins, a St. Helens chemical engineer, was one of a party of 27 technicians visiting the United States as a "productivity" team who were made honorary citizens of Texas on May 23 at Austin, Texas. The ceremony was arranged by the University of Texas and Austin Rotary Club.

Mr. William Smith, managing director of James Crean and Son, Ltd., Liverpool and Leigh, oil and tallow refiners and margarine and cooking fat manufacturers, has been elected president of the Seed, Oil, Cake and General Produce Association.

All six retiring members of the Council of the Pharmaceutical Society of Great Britain have been re-elected, with the addition of Mr. C. W. Macfarlane, Dundee. There was a record poll.

Mr. William C. Peck, a director of Apex Construction, Ltd., has been re-elected to the Senate of the University of London.

Mrs. Lily Kipping, of Criccieth, widow of Professor Frederick S. Kipping, F.R.S., formerly Professor of Chemistry, University College, Nottingham, and a pioneer research worker in organic chemistry, left £12,828 (net £12,728).

Mr. E. Glanvill Benn, chairman of Benn Brothers, Ltd., proprietors of The Chemical Age, is one of the delegates to the Imperial Press Conference in Canada this month. The U.K. delegation, headed by Colonel J. J. Astor, of *The Times*, who is president of the Empire Press Union, left Liverpool on Tuesday in the C.P.R. *Empress of Scotland.*

Mr. Charles W. Robinson has joined the board of Evans Medical Supplies, Ltd., as pharmaceutical development director. He was, from 1945, secretary of the Association of British Pharmaceutical Industry.

Ten New Fellows

THE election of ten Fellows and 26 Associates is announced by the Institute of Physics. In addition 46 graduates, 2 subscribers and 11 students were elected.

The new Fellows are:—

J. R. Atkinson (Glasgow), G. E. Baoon (Harwell), H. Barrell (Teddington), D. W. Gillings (London), A. Hargreaves (Manchester), M. Milbourne (Birmingham), G. Morris (Stevenston, Ayrshire), T. L. Richards (Birmingham), H. Tompa (Maidenhead), C. G. Wynne (Bromley, Kent).

The following are new Associates:—

I. P. Bell (Port Sunlight), W. R. Blunden (Australia), K. W. Bridger (London), R. Brooks (Northwich, Cheshire), A. G. Cannon (Avonmouth), P. Denton (Manchester), J. F. Dillon (Surrey), D. Gifford (Bristol), A. M. Goddard (Derby), R. H. Hall (Woking, Surrey), E. L. Hanson (London), W. E. Hurley (Gillingham, Dorset), E. B. Jones (Holywell, Flints)., E. W. Jones (Harwell), H. D. Keith (Bristol), J. B. Le Poole (Holland), E. D. Maloolm (Glasgow), J. Moore (Risley Lancs.), E. Riley (Ashby de la Zouch), B. N. Sen (India), H. S. Sowery (Glasgow), N. S. Thumpston (Shoeburyness, Essex), W. F. Ware (Cardiff), G. J. Williams-Leir (London), J. W. Winstanley (Manchester), B. A. Worswick (Paisley).

John Benn Boys' Hostels

TRIBUTE to the work of Sir Ernest Benn in founding the John Benn Boys' Hostels Association, and to others who had done so much to make King George's House a real home for boys who had no other home, was paid by Lord Justice Denning at the organisation's recent annual dinner in London.

Sir Ernest Benn, past president, gave a cordial welcome to the new president, the Earl of Derby, who, he said, had just taken the helm in "this good ship" when the weather forecast for voluntary effort was discouraging. Mr. A. Townshend, the warden, announced that during the evening subscriptions totalling £1274 had been received.

Obituary

Mr. George Livings, lately works manager of Dunlop's factory in Cambridge Street, Manchester, who has died at the age of 74, helped, in the early stages of his 53 years' service, to make some of the first pneumatic tyres.

◆ OVERSEAS ◆

Eastern Berlin Chemical Trust

Vereinigung volkseigener Chemiebetriebe, Berlin, (VVBB-Chemie) centre of the nationalised chemical enterprises in the Russian sector of Berlin, was reported at the end of March, 1950, to comprise 47 individual units with 8112 workers. Dm 1 million is to be made available this year for expansion purposes.

U.S. Loan for Mexican Coal Mining

The Export-Import Bank of Washington has approved a loan of $2.7 million to a Mexican Government agency, S.A. Nacional Financiera, to develop a coal mine and erect a cleaning plant at Palau, Coahuila. The new plant is to have an ultimate yearly output of 525,000 metric tons of clean coal.

Capital for Swiss Nylon

Evidence of the intention of Holyverzuckerungs AG to implement its plans to manufacture Grilon—the Swiss form of nylon—is given by the recent increase in the share capital of Fibron, SA, an associate company, from S. fr. 500,000 to S. fr. 5 million. The new plant, which will adjoin the existing factory at Domat-Ems, is expected to employ about 250 workers

Rising Output of Ammonium Sulphate

Factory sales of ammonium sulphate by Canadian producers in 1949 amounted to 214,596 tons, valued at $9,481,226, against 208,775 tons worth $8,090,002 in the previous year, the Dominion Bureau of Statistics reports. Exports during the year totalled 167,147 tons, valued at $7,851,153, compared with 146,379 tons ($5,923,549) in 1948.

Uranium Talks

Arising out of the investigations last year (The Chemical Age, 61, 791) by representatives of the U.S. Energy Commission and their counterparts in this country of the possibility of recovering uranium ore as a by-product of goldmining, and the discussions with the South African Atomic Energy Board, further talks between the three countries will take place in Washington in the late summer or autumn. It is stated that the intention is to determine the conditions in which South Africa would sell to Britain and the U.S.A. the potentially large quantities of low-grade uranium ore which could be extracted in the Union.

Chilean Mining Output

Mining production statistics, published by the Banco Central de Chile, show a slight decrease last year. Output, in 1000 in. tons, included: nitrate of soda, 1770 (1788 in 1948); copper, 371 (445); iron (fine content) 1663 (1681).

Listerine in India

A report from India says Mr. R. D. Sharpe, export sales manager of the Lambert Pharmacal Co., has arrived there to confer with Indian manufacturers and study current market trends of Listerine. He was seeking a firm which could manufacture Listerine antiseptic and other pharmaceuticals using Listerine.

Modern Coal Mine for Germany

The Emil Mayrisch double-shaft of the Eschweiler Mining Union, in the Aix-la-Chapelle coal mining basin, is to be developed into the largest and most up-to-date bituminous coal mine in Europe, states a German report. Mining rights extend over 30.1 million sq. m., containing high-grade bituminous coal.

Norwegian Fish and Whale Oil

Norway's largest factory in the fat processing industry, De-No-Fa (De Nordiske Fabrikker), Fredrikstad, last year processed more whale and herring oil than ever before, 102,506 tons. The value of sales last year was the equivalent of £9 million, of which almost £8 million was in foreign currencies. Gross profit made was £900,000, and net profit £270,000. The company is paying increased attention to refining herring oil. Output of herring oil in Norway last season was 50,000 tons compared with 180,000 tons of whale oil.

Increasing Turkey's Coal Output

The competitive position of West European coal producing and exporting countries in the Mediterranean and Near Eastern markets will be affected by current plans for the development of the rich Turkish coal deposits at Zonguldak. These —the only known occurrence of coal in the Mediterranean—extend over some 50 km. and contain seams of up to 20 metres. They are of good bituminous coal of coking quality as well as lignite. Output rose from 1,420,000 tons in 1929 to just over 4 million tons in 1948. Production is to be increased to at least 7 million tons by 1953. Some $40 million have been made available by the ECA.

WORLD POWER CONFERENCE

IN connection with the Fourth World Power Conference, to be held in London from July 10 to 15, it is announced that it will be impossible to accept any more applications from intending British members of the conference. The closing date was May 31. Membership registrations now total about 1350, and are expected to reach 1500. Approximately one-half the members of the conference will come from 40 Commonwealth and foreign countries, and approximately one-half from the U.K

The time-table of the technical sessions is:—

July 11, Energy Resources and Power Developments; Other Sources of Energy; Preparation of Solid Fuels (Coke); Preparation of Diesel and other liqued fuels.

July 12, Production of Steam Power (developments in power station design); Production of Steam Power (miscellaneous fuels); Water Power (resources and location of plant); Preparation of Solid Fuels (coal); Internal Combustion Engines; Water Power (design of power stations).

July 13, Production of Steam Power (turbines and auxiliaries); Preparation of Solid Fuels (lignite, brown coal, peat); Water Power (aspects of plant design); Production of Steam Power (steam generation); Preparation of Gaseous Fuels (natural gas and gas from liquid fuels); Preparation of Liquid Fuels (petroleum).

July 14, Gas Turbines and Jet Engines; Preparation of Gaseous Fuels (gas from solid fuels; Atomic Energy.

New Oil Standard

COMPOUND cod oil, of a type which is largely used by the leather industry for tanning, or for currying and dressing of leather is the subject of a British Standard (B.S. 1582: 1950) recently issued by the British Standards Institution.

The Institution observes that the properties which are required in oils for these purposes may not be entirely understood, and it may not be practicable to include standards for some of the physical properties of oils which are believed to be important in currying processes. The standard is, therefore, only intended to ensure that oils which comply with it are of reasonable standards of quality, free from gross adulteration, and of a type which is known from practical experience to give satisfactory results as a general rule. The standard gives details of the characteristics of the oil and of the full methods of test.

NEXT WEEK'S EVENTS

MONDAY, JUNE 5

The Chemical Society

Oxford: Physical Chemistry Laboratory, 8.15 p.m. Alembic Club lecture. Prof. W. E. Garner: "Catalysis on Oxides."

TUESDAY, JUNE 6

Mechanical Handling

London: Olympia (until June 17), National Mechanical Handling Exhibition.

WEDNESDAY, JUNE 7

North Western Fuel Luncheon Club

Manchester: Engineers' Club, 12.45 p.m. Sir Charles Ellis: "Coal *versus* Oil."

FRIDAY, JUNE 9

Society of Leather Trades' Chemists

London: Leathersellers' Technical College, Tower Bridge Road, S.E.1, 2.30 p.m. R. Faraday Innes: "Forty-eight Years in the Profession of Chemistry."

SATURDAY, JUNE 10

Society of Chemical Industry (Agriculture Group)

Bracknell, Berks. Summer meeting at Jeallott's Hill Research Station.

The Institute of Physics (Electronics Group)

London: 26 Portland Place, W.1. 2.30 p.m. Papers on "Gas Discharges"; H. G. Jenkins: "Discharge Tubes Used for Lighting"; O. L. Ratsey: "Potential Distribution in Hot Cathode Gas Diodes and Triodes"; E. A. Roberts: "Voltage Stabilisers."

London Aluminium Co., Ltd.

IN the article "Engineering Advances at Birmingham." (THE CHEMICAL AGE, 62. 747) in the description of the BIF exhibit of the London Aluminium Co., Ltd., the scale model of the Diamond plant for the recovery of glacial acetic acid was wrongly stated to have been made of aluminium. It was, in fact, of copper and stainless steel. Also, the Merz plant for the solvent extraction of sugar cane wax from filter press mud was made in mild steel, not in aluminium as was stated.

DSIR'S Change of Address

On June 1, 1950, headquarters of the DSIR will be transferred from Dorland House and Rex House, Regent Street, to Charles House, 5-11 Regent Street, S.W.1. The telephone number (Whitehall 9788) is unchanged. For the present, headquarters of the hydraulics research organisation and the mechanical engineering research organisation remain in Rex House.

The Stock and Chemical Markets

MARKETS have been more cheerful, prices in most sections tending to improve. This was attributed more to absence of selling than to buying, which remained moderate and cautious in most sections. British Funds were helped by the premium established by the new 3½ per cent East African stock and by the prevailing assumption that the forthcoming £20 million British Coal issue will also be a 3½ per cent stock.

Industrial shares were inclined to respond to reports of increasing output, increasing sales and further progress being in export markets. Increased net profits are probably being offset in most instances by rising costs and higher prices of raw materials since devaluation. It is now assumed, however, that many companies have reasonable prospects of maintaining their dividend payments, and on this basis, industrial shares at current prices offer not unattractive yields.

Chemical and kindred shares have been steady, with Imperial Chemical at 40s. 7½d., Monsanto 48s. and Fisons 25s. 3d., while Laporte Chemicals 5s. units changed hands up to 9s. 7½d. Albright & Wilson were 28s. 3d., Brotherton 19s. 3d. and William Blythe 9s. 3d. Glaxo Laboratories 10s. units have been firmer at 47s. 3d., but shares of plastics companies, although holding most of recent gains, were inclined to ease, and British Xylonite came back to 77s. 6d. De La Rue were better at 23s. 3d., British Industrial Plastics 2s. shares 5s. 9d., and Erinoid 8s. 6d.

The 4s. units of the Distillers Co. changed hands around 18s. and British Glues 4s. shares were 20s. 9d. Lever & Unilever, however, remained uncertain around 39s., it being uncertain that the Dutch Lever NV will be able to maintain its dividend. (Shares of the latter were 37s. 7½d.). In other directions, Turner & Newall rallied to 82s. 3d. and British Oxygen to 92s. 3d. British Aluminium kept steady at 39s. 3d., Borax Consolidated were 51s. 9d. and Boots Drug, at 49s. 9d., made further response to the financial results.

Dunlop Rubber strengthened to 61s. 6d., the freeing of petrol being expected to result in an increased demand for tyres. United Molasses have risen further to 44s. 9d., and elsewhere, Associated Cement were again higher at 82s. 6d. British Plaster Board were firm at 16s. Paint shares generally moved in favour of holders, although Lewis Berger eased slightly to 27s. 10½d. on the £1 million debenture issue. Pinchin Johnson were 42s. 7½d., International Paint 15s. 6d. and Goodlass Wall around 34s. 9d.

Iron and steels remained firm. It is hoped that it may not be long until steel sheets and tinplate are freed. John Summers, at 28s. 3d., were firm on the expectation that shareholders will be given preferential terms of allotment in the pending debenture issue. Guest Keen have strengthened to 42s. 7½d., United Steel were 26s. 3d. and Stewarts & Lloyds 55s. Colliery shares have been firm in anticipation of interim compensation, following the British Coal issue. Powell Duffryn were 29s., Staveley 80s. 6d., Bolsover 57s. 6d. and Butterley 46s. 9d.

Amalgamated Metal remained at 26s. 6d. Oil shares rose sharply on the de-rationing of petrol, which will permit greater co-operation between the big oil groups in world markets.

Market Reports

SATISFACTORY trading conditions prevail in most sections of the industrial chemicals market and contract deliveries are being called for on the fullest scale. The markets generally appear brighter as a result of the de-control of motor spirit which indirectly is expected to give a fillip to many industries where the high price factor does not prevent it. The soda products continue in steady demand and a fair amount of new business is reported for soda ash and sodium carbonate. The potash chemicals remain firm and other items finding a ready outlet include hydrogen peroxide, borax, formaldehyde and the barium compounds. Most of the coal tar products are in steady request and no price changes have been notified.

MANCHESTER.—Trading conditions have been quieter on the Manchester chemical market this week. This, however, is normal experience at this season of the year when many consuming establishments in the Lancashire area, in common with other places. close down for varying periods for the Whitsun holidays. Deliveries against standing orders have been on a smaller scale, and new inquiries on both home and export account have been fewer. Prices generally remain on a strong basis, and zinc compounds have advanced further as a result of a fresh rise in the metal price. Further rises are now anticipated. Ferti-

(continued at foot of next page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALLEN & HANBURYS, LTD., London, E., chemists, etc. (M., 3/6/50.) April 29, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *£57,613. January 6, 1949.

Increases of Capital

The following increases in registered capital have been announced: Vitax, Ltd., from £25,000 to £40,000; Audas & Thomson, Ltd., from £100 to £13,000.

New Registrations

A. & W. Elles, Ltd.

Private company. (481,499). Capital £1000. Manufacturers, constructors of technical apparatus, electrical, chemical and mechanical goods, etc. Directors: G. M. Keates, J. Huggett. Reg. office: 20 Half Moon Street, W.1.

Steralic Filters, Ltd.

Private company. (482,163). Capital £3000. Chemical, mechanical, electrical and civil engineers, etc. Directors: A. J. Simpson, K. A. Williams, T. C. P. Williams and J. F. Zwicky. Reg. office: Station Works, Beaconsfield, Bucks.

Styrene Products, Ltd.

Private company. (482,033.) Capital £200,000. Manufacturers, producers, refiners and distillers of styrene and styrene derivatives, mineral and vegetable oils, petroleum products, terpenes, esters, synthetic resins, coal, coal products and chemicals derived therefrom, and any other organic and inorganic chemicals and other materials, etc. Reg. office: 170 Piccadilly, W.1.

Wilbur Engineering Company, Ltd.

Private company. (482,964). Capital £500. Mechanical, electrical and chemical engineers, etc. Directors: J. W. Burgess, B. L. Burgess. Reg. office: 25/33 Popesgrove Mansions, Heath Road, Twickenham, Middlesex.

Japanese Ammonium Sulphate

THE reduction in Japan's ammonium sulphate productive capacity during the war was about 60 per cent—high in comparison with other industries. It has since recovered and present capacity is 1.7 million tons, compared with 2.4 million tons before the war. There are 18 factories.

Output, however, is well below capacity, and so far has been limited by the lack of adequate power, and, in factories and plant built by foreign interests, by the delay in importing equipment.

The principal companies, and their outputs (in 1000 tons) are: Toyo Hochdruck KK. (Omuta works 97, Sunagawa 37, Hikoshima 10); Nisshin Chem. Co. 126; Ube Kusan KK. 115; Showa Electro-Chem. Co. 93; Nitto Chem. Co. 90; Nissan Chem. Co. 73; Toa Synthetic Co. 54; Nippon Nitrogen Co. 53; Mitsubishi Synth. Chem. Co. 51.

Costs of production vary from yen 15,000-28,000 per ton, and works using electrolytic hydrogen are generally said to fare better than those using hydrogen from water-gas. High costs are attributed partly to the poor quality and high ash content of the coal used.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

lisers have met with a quiet demand, and fresh buying of tar products has been on only a moderate scale.

GLASGOW.—The turnover in the Scottish chemical market during the past week has been up to the recent average, although there has been considerable uncertainty about prices. There have already been a number of price increases and, in addition, it is understood that there will be many others during June. In some industries the increase in price of white spirit, xylol, etc., as a result of the higher duty and now a further increase due to the greater cost of freight, is going to have a serious effect, and there seems no possibility of this increase being absorbed by the manufacturers.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2 at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Methods of purifying oleic acid, and the purified oleic acid resulting therefrom.—Emery Industries, Inc. Feb. 12 1947. 639,550.

Methods of preparing polybasic polymers from poly-unsaturated fatty acids, and the polybasic polymers resulting therefrom.—Emery Industries, Inc. Feb. 12 1947. 639,551.

Production of hydrogen-containing gases.—I.C.I., Ltd., and W. Stannage. Feb. 27 1948. 639,554.

Production of sheets and other bodies of polymeric resin.—I.C.I., Ltd., and A. L. L. Tompsett. March 12 1948. 639,557.

Apparatus for treating fluids by radiation.—M. Pequignot. March 27 1947. 639,467.

Separating constituents of coke oven gases.—Koppers Co., Inc. April 1 1947. 639,400.

Manufacture of derivatives of oxazolidine-2: 4-diones and intermediates thereof.—British Schering Research Laboratories, Ltd., J. S. H. Davies, and W. H. Hook. May 3 1948. 639,559.

Manufacture of steel sheet piling of Z or like shaped section.—Tata Iron & Steel Co., Ltd. April 10 1947. 639,560.

Glass with electrically-heated coatings.—Corning Glass Works. April 11 1947. 639,561.

Coagulating rubber from latex.—E. L. Gericke, and P. Torr. May 13 1947. 639,405.

Uniting of polythene and like substances with other minerals.—Telegraph Construction & Maintenance Co., Ltd., R. C. Mildner, and A. A. W. Barnes. July 9 1948. 639,575.

Process for the separation and recovery of radioactive decay products of elements.—A.S.P. Chemical Co., Ltd., C. L. Walsh, B. A. Adams, and R. C. Barker. July 14 1948. 639,265.

Resinous compositions, particularly adapted for use as a mould.—B. F. Goodrich Co. Sept. 12 1947. 639,592.

Method for improving the strength of artificial insolubilised protein filaments.—I.C.I., Ltd., D. Traill, and G. K. Simpson. Dec. 20 1948. 639,342.

Preparation of penicillin salts.—Boots Pure Drug Co., Ltd., A. J. P. Marton, and S. W. Stroud. Jan. 19 1949. 639,432.

Method of reactivating finely divided catalyst.—Universal Oil Products Co. Feb. 2 1948. 639,484.

Production of ethyl chloride.—I.C.I., Ltd., and R. T. Foster. Feb. 7 1949. 639,435.

Preparation of organic nitriles.—E. I. Du Pont de Nemours & Co. Feb. 25 1948. 639,438.

Process for the manufacture of a dicarboxylic acid.—I.C.I., Ltd., E. Harrison, and R. May. March 11 1949. 639,491.

Manufacture of solid polymers of ethylene.—E. I. Du Pont de Nemours & Co. April 5 1948. 639,306.

Process for the manufacture of adenosine-5^1-triphosphate.—Medical Research Council, A. R. Todd, A. M. Michelson, and J. Baddiley. March 11 1949. 639,492.

Manufacture of halogenated amines.—British Celanese, Ltd. June 4 1948. 639,367.

Contrivance to convert calcium hydroxide to calcium carbonate in water for the feeding of steam boilers and the like to settle the calcium carbonate.—F. Kopecky, and F. Vondruska. May 24 1947. 639,460.

Methods for eliminating carbon monoxide from gaseous mixtures.—Soc. Chimique de la Grande Paroisse, Azote et Produits Chimiques. Oct. 10 1945. 639,652.

Manufacture of luminescent materials.—British Thomson-Houston Co., Ltd. (General Electric Co.). April 17 1947. 639,823.

Production of phosphate fertilisers.—F. L. Smidth & Co., A/B. Aug. 12 1946. 639,713.

Beta-thio-carboxylic acid compounds and method of preparing the same.—B. F. Goodrich Co. Sept. 6 1946. 639,679.

Cyclic process for producing dicalcium phosphate by reacting raw phosphate with phosphoric acid.—Directie Van De Staatsmijnen in Limburg. Sept. 16 1946. 639,775.

Manufacture of 7-dehydrosterol.—N.V. Philips' Gloeilampenfabrieken. Oct. 23 1946. 639,714.

Educational appliances for teaching chemistry.—D. E. Hardie, and G. O. Sutherland. Jan. 28 1948. 639,654.

Compositions containing vinyl chloride and vinylidene chloride polymers and copolymers.—J. C. Arnold. (Standard Oil Development Co.). Feb. 14 1947. 639,777.

Hydrogenation of butadiene.—I.C.I., Ltd., and D. McNeil. Feb. 27 1948. 639,778.

CLASSIFIED ADVERTISEMENTS

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The New India

THE dominant theme in India to-day, and to a large extent in Pakistan, is the determination to discard the role of supplier of raw materials and importer of finished goods. The effects of that policy have brought marked contraction of some British export totals—and no immediate portents of prosperity for India. One of the few things that are certain about this is that the new policy will not be lightly relinquished, despite the fact that acute shortages have enforced some moderation of the limitation of imports. The other is that India's, and probably Pakistan's, emergence as a manufacturer will not be accomplished without great struggle and some tribulation.

Two recent books by Indian scientists reveal the great tasks that lie ahead for Indian science and stress the intellectual capacity of her scientists. A. K. Madan's " Economic Prospects of Chemical Industries in India " (Thacker & Co., Bombay, 1949) presents the views of an industrial chemist; while Dr. A. N. Puri's "Soils, Their Physics and Chemistry " (Reinhold Publishing Corp., U.S.A., 1949) shows that Indian scientific research and thought can reach the highest levels of originality and imagination. The two books offer an extreme contrast in outlook. A. K. Madan's account of Indian industrial science is largely a survey of what still needs to be established, of what India could produce for herself but still does not. Dr. Puri's longer book is an outstanding and controversial contribution to soil science, and his re-examination of many orthodox conceptions will win respect and possibly much support from soil scientists elsewhere. More than a quarter of a century of distinguished personal research has led Dr. Puri to a point when he feels able to suggest new approaches to the fundamental changes, chemical and physical, which occur in all soils. That enabled him to offer a stimulating contribution to scientific thought, one that is not in any way limited to Indian conditions.

Mr. Madan's survey of chemical industries—a "masterpiece," if we are to believe the publishers—reveals how far India has yet to go before attaining even partial self-sufficiency in the manufacturing field. A summary of standard industrial chemical processes which are conducted in most countries but have still to be introduced to India takes up much of his space. It is revealing that so much

On Other Pages

Leader:

The New India . . 839

Notes and Comments:

Competition . . 841
Economic Handling . . 841
Case for Tax Repeal . . 841
Atomic Fuel Bill . . 842
Temperature Changes of Metals . 842
Tax on Hydrocarbon Oils . . 843
More Price Rises . . 844
Petroleum Pitch . . 844
Rapid Mechanical Handling . . 845
Chemical Concessions to Germany . 847
English Chemists in Holland . . 848
Evaluating the Solvents . . 849
Ethylene by Partial Combustion . . 851
Brazilian Specialists' Visit . . 852
Researches on Air Pollution . . 853
World Sources and Production of Potash . . 854
Characteristics of a Cooling Process . 855
Nitrogen-Free CO_2 . . 856
Photometric Tests of Cement . . 857
New Analytical Method for Aluminium . . 858

OVERSEAS CHEMISTRY AND INDUSTRY

Complex Chemical Compounds . . 859
Metal Powder Technology . . 859
Rising Output in Norway . . 860
New Production in Austria . . 860
Insecticides for the East . . 860
Detecting Ammonia Leaks . . 861
Radioactive Emission Gauging . . 862
Grease Products . . 866
New BAC Branches . . 866
New Rubber Industries . . 866

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"bread-and-butter" chemical industry should have to be presented as India's *future* prospects. "So much to do, so little done" might be the motif of Mr. Madan's survey, and when he deals with India's resources he invites the gloomier rider "and so little to do it with!" It is clear that there cannot be any notable expansion in India's production of chemical necessities unless a much bolder effort is made to find and develop new mineral resources. Although she has long been regarded as a storehouse of raw materials by other manufacturing countries, India lacks many of the key minerals for heavy chemical industry.

India possesses excellent supplies of iron and manganese ores, bauxite, barytes, chromite, salt, mica, thorium and cerium ores and ochres. Her gypsum and limestone resources are poor. But her coal reserves are bad and her petroleum oil fields so few and small that their output must be written off as insignificant. Supplies of tin, lead, zinc and copper ores are bad; potash and phosphate deposits are negligible. It is difficult to believe that so large and old a section of the world's crust cannot yield more than this. Partition, however, has not helped India's mineral economy; for example, one of the best gypsum deposits, which had been expected to serve India's synthetic fertiliser industry, is now out of reach within the frontiers of Pakistan. India possesses plentiful iron ores, but iron ores without coal in similar abundance cannot make a steel industry.

The technical development of other sources of power and of materials will require vast numbers of scientists and technologists. It may be asked how, without a vigorous chemical industry *now*, can India develop that army of industrial scientists she will need in the future? Education and opportunity go together. Of education, Mr. Madan says: "The technical institutions can easily be counted on finger tips" . . . and "the industrialists and capitalists engage their own people . . . irrespective of merits. The key posts in the various departments of Government services are usually distributed in a similar way. . . . Some of the finest brains are allowed to rot . . ." If these comments are true—and Mr. Madan's book is objectively written without any rhetorical interludes—they indicate a precarious foundation for industrial and scientific expansion.

Notes and Comments

Competition

"GONE are the days when, for many products, we were unable to produce enough for all our customers at home and overseas and had to resort to rationing of one kind or another. . . There was a time when it was possible, and indeed our national duty, to obtain enhanced prices for our exports, and, but for the prices we received in our export markets, we should not have been able to keep our home prices so low. To-day we must keep a most careful eye on our prices if we are not to lose business to keen competitors." Lord McGowan on Wednesday summed up in those terms to shareholders of I.C.I. the most important of the changes to which many chemical industries now are bound to adapt their programmes. To indicate how well I.C.I. has been able to accommodate itself, the chairman made good use of the fact that the total turnover in 1949, £174 million, was £10 million more than it was a year before and the export return was also larger. Meanwhile, costs are rising—of materials, labour and especially of plant—and margins are shortened. The sellers' market is a thing of the past and the need now to secure every economy which heightened efficiency and prudent saving can procure has evidently acquired an urgency far greater than ever before. Nothing could be more favourable to progressiveness in industrial chemistry, a quality in which this country is certainly not deficient.

Economical Handling

THE need of higher productivity and the spreading of new techniques to achieve it are the urgent aims of the moment adding considerably to the interest of the current exhibition at Olympia of large-scale mechanical handling and the conferences to be held this month by the Institution of Production Engineers and the British Institute of Management. Both conferences have regard for the importance which industry attributes to the subject of mechanical handling. The subject was effectively introduced by the recent publication of "Materials Handling in Industry", a report by the Anglo-American Council on Productivity, prepared by a team which visited the U.S.A. towards the end of last year. The belief that better handling can save America at least $2000 million a year is supported by the extensive growth, noted in the report, of mechanical aids which already have greatly reduced costs. In Britain, where manufacturers have in the past had less urgent need to study all possibilities of "streamlining" production, a comparable economy might well be achieved. A chart in the report shows the work involved in the preparation of a small diecasting of aluminium alloy. Of the 54 operations, from the unloading of the ingots to transport of the finished casting to the assembly bay, only eight had been pre-planned and time studied. Several operations of the non-productive kind could be eliminated; others could be combined. An additional argument for fuller mechanical handling is the benefit it confers on the industrial worker, by the reduction of hazards and unproductive "donkey work" which only 20 years ago might have been considered unavoidable.

Case for Tax Repeal

A LITTLE brochure just issued by the Industrial Light Oils Committee—a composite body consisting of representatives of 17 of the using trades' associations—sets out a strong case for the repeal of the duty on light hydrocarbon oils used for industrial purposes and not for road use. An arresting coloured cover emphasises that Great Britain is the only major industrial country where no remission of tax on these oils is accorded to industrial users. In a foreword, the committee points out that the duty, earlier a grievous burden at the original rate of 9d. a gallon, will at the new figure of 1s. 6d. be most damaging to the capacity of many manufacturing industries, such as paint, polishes, linoleum, printing inks, cellulose lacquers, and plastics—to compete in export markets and to offer minimum prices to the home consumer. An appendix on the description and uses of industrial hydrocarbon oils subject to the so-called petrol tax. It is significant that Italy and Western Germany, now recovering their economic freedom and capacity to compete with the United Kingdom in overseas markets, have both granted a preferential rate of duty on light oils used by their industries.

Atomic Fuel Bill

THE welcome lull in the past few months in the spate of " electrifying " news and views, generally unbalanced, about atomic fission in bombs or in industry was interrupted at Oxford on June 2, by one of the infrequent authoritative summaries which help to keep the topic reasonably in perspective. Giving the Romanes Lecture in the Sheldonian Theatre, Sir John Cockcroft indicated that the first major objective in what has come to be regarded as the " ten-year plan " for industrial utilisation was to perfect economical extraction of low-grade uranium ores (20 times as abundant as silver) and the second to develop the "breeder" pile, yielding secondary fuel, possibly faster than it disintegrated U_{235}. Harwell is to build one " in due course ". Those requiring a definition of the latter phrase found firmer ground in the principal atomic scientist's view that we may see specialised units for nuclear power within the next five years. He gave as a condition for that much to be desired culmination the successful use of 1 per cent uranium. Then, in an atomic powered generating station, one ton of uranium ore would replace the 300 tons of coal required in conventional generators. Such saving, however, would not pass intact to the profit account. Much of it would be required to offset the high chemical engineering costs for uranium extraction and metal making. That invites speculation whether some specialist chemical engineers and physicist collaborators will one day direct expenditures nearly as large as the National Coal Board's—perhaps much more fruitfully.

Temperature Changes of Metals

THE custom of regarding the melting and solidifying points of metals as being identical for all practical purposes will have to be reconsidered in the light of the magnitude of the disparities now recorded by U.S. metallurgists, notably by Dr. David Turnbull, of the G.E.C. research laboratory. Workers there say they have established that metals of extreme purity solidify at temperatures very much below their known melting points. The difference between the two fixed points has been described as a fairly uniform 20 per cent and is said to have been proved for selenium, bismuth, lead, antimony, cobalt, iron and palladium. The uniformity of results so far suggests the same result may be found for the other metals now being subjected to microscopic tests in a temperature-controlled metal chamber with a quartz observation window. The answer to the natural question why so fundamental a fact has escaped the attention of the metal industries is that it has very little importance for their practical purposes. Only the purest metals obey this apparent law; the smallest impurity is said to produce a very large rise in the temperature at which solidification occurs.

International Conference on Atomic Energy

Two hundred atomic scientists from the Western countries are expected to attend the first large international conference to be held in Britain on nuclear physics. Organised by the Atomic Energy Research Establishment, Harwell, the conference will be held at Oxford from September 7-13.

TAX ON HYDROCARBON OILS

Official Explanation of Categories

THAT a good deal of uncertainty exists in regard to the imposition of tax at the rate of 9d. a gallon on hydrocarbon oils, particularly as to which oils are subject to it, is confirmed by a letter to *The Times* last week from a manufacturer of chemicals. This correspondent pointed out that no one appears to have tried to explain why hydrocarbons such as benzol, xylol, naphtha, etc., should be subjected to the additional 9d. a gallon tax, these materials being entirely obtained from coal tar produced in this country.

Another point raised by this manufacturer is that these solvents, essential as they are in many sections of the chemical and related industries, form part of innumerable products which are exported. The tax, therefore, which in some cases increases the cost of the solvent by 25 per cent, puts the industry in an even more unfavourable position in making goods for export.

The writer claims that, where these solvents are used for chemical conversion the tax is, apparently, remitted, so that in some factories a proportion of the solvents is taxed and the rest may be free from tax.

What Are "Light Oils"?

The official Customs and Excise explanation of what is meant, for purposes of this tax, by the term "hydrocarbon oils," is petroleum oils, coal tar and oils produced from coal, shale, peat or any other bituminous substance, and all liquid hydrocarbons; but it does not include hydrocarbons or bituminous or asphaltic substances which are solid or semi-solid at a temperature of 60° F. (in accordance with tests prescribed by the Commissioners of Customs and Excise). The term "light oils" means hydrocarbon oils of which not less than 50 per cent by volume distils at a temperature not exceeding 185° C., or of which not less than 95 per cent by volume distils at a temperature not exceeding 240° C., or which give off an inflammable vapor at a temperature of less than 22.8° C. when tested in the manner prescribed by the Acts relating to petroleum. In other words, this additional 9d. a gallon tax applies to a whole category of oils, whether they were imported or not.

The term "heavy oils" means hydrocarbon oils other than light oils. "Heavy oils (road fuel)" means heavy oils used as fuel for a mechanically propelled vehicle constructed or adapted for use on roads.

A rebate of 9d. per gal. is allowed on the delivery for home consumption of heavy oils (other than heavy oils (road fuel)) which contain in solution hard asphalt in amount not less than 0.5 per cent; of heavy oils (other than heavy oils (road fuel)) of which not more than 50 per cent by volume distils at a temperature not exceeding 240° C. and of which more than 50 per cent by volume distils at a temperature not exceeding 340° C.; and of heavy oils other than heavy oils (road fuel)) of which more than 50 per cent by volume distils at a temperature not exceeding 240° C. (These definitions relate to oils generally described as fuel oil, gas oil, diesel oil and kerosene.)

Duties Payable

A rebate at the rate of 8d. per gal. is allowed on the delivery for home consumption of other heavy oils (except heavy oils (road fuel)). The duty payable is thus 9d. per gal. on light oils; 9d. per gal. on heavy oils (road fuel); and 1d. per gal. on other heavy oils (e.g., lubricating oil), except those stated above to be subject to rebate, which are in effect duty free.

It is illegal for any person to mix any oil on which rebate has been allowed with any light oils unless he has been granted a licence for this purpose by the Commissioners of Customs and Excise and has, before mixing, paid the amount of duty which would have been paid if the rebate had not been allowed.

Repayment of duty is allowed in respect of any hydrocarbon oils which have been used on board British registered fishing boats, and of hydrocarbon oils other than light oils used as fuel for the machinery of vessels, other than pleasure yachts, while engaged on a voyage in home waters.

In the case of hydrocarbon oils in or removed to a refinery, duty is charged on the delivery of any goods from the refinery and is the same as that which would be payable on the importation of the same goods, and the same rebate as would be allowed on importation is allowed.

(*continued overleaf*)

PETROLEUM PITCH

Superior Bonding Properties

ONE of the by-products of the Catarole cracking process by which chemicals are produced from petroleum at Partington is Catarex pitch, introduced by Petrochemicals, Ltd.

This material, which is odourless and tasteless, can be supplied to any specified melting point within the range of 40° to 100° C.

It is said to possess properties which in many repects lie between those of straight run petroleum bitumen and coal tar pitches. In absence of nitrogen and oxygen compounds and in its very low sulphur content it is claimed to be superior to both these products.

Important characteristics of the pitch are the low free carbon and ash content which make possible its specialised application in the electro-metallurgical field. High temperature susceptibility and relatively high coking value make it of particular interest for the impregnation of carbon fabrications where a high carbon content would result in the formation of scum on the surface of the material being impregnated.

The pitch shows good bonding properties and, when combined with a platiciser, may be used successfully for the protection of metal surfaces. With suitable treatment, this material should prove of value for use in tank-lining, pipe enamels, bitumastic paints, rubber reclaiming, the electro-metallurgical and cable industries, etc.

TAX ON HYDROCARBON OILS

(*continued from previous page*)

The effect of the impact of the tax on commercial road users' cost was forcibly expressed by Colonel Arthur Jerrett, president of the Traders' Road Transport Association, the national organisation for "C" licence-holders, who was the spokesman for a deputation representing all motor vehicle users and manufacturing and trade interests recently received by Mr. Hugh Gaitskell, Minister for Economic Affairs, at the Treasury.

The deputation presented the case for the remission of the extra tax on petrol and the purchase tax on commercial vehicles proposed in the recent Budget. Colonel Jerrett said that the trade and industry of this country were "very definitely shocked by the Chancellor's proposals," and the additions to the cost of operating commercial road transport had already led to a material increase in goods transport charges.

MORE PRICE RISES

High Rates for Base Metals

AN immediate increase in the price of refined nickel in the United Kingdom was announced on June 1 by the International Nickel Company of Canada and its associated companies, the International Nickel Company, Inc., U.S.A., and the Mond Nickel Company, Great Britain.

The new price fixed by the Mond Nickel Co. in the U.K. is £886 a ton, delivered, compared with £821 10s. a ton established on September 21, 1949. Appropriate increases are made for other countries.

It is pointed out by the company that these prices correspond to those announced for Canada and the U.S.A. They represent an increase of only 40 per cent above the average price prevailing for all markets in the pre-war years, compared with increases for other base metals varying from 65 to 125 per cent.

The present increase is stated to have been brought about by higher rates of pay for labour and for supplies and services and to be necessary to compensate for the rise in costs which have mounted steadily since before the war.

Sharp Rise in Zinc Prices

An increase in the price of good ordinary brand zinc by £12 a ton, from £111 10s. to £123 10s. a ton delivered, was announced on June 4. This fresh rise was the third increase within 10 days, the price being advanced by £4 a ton on May 25 and by the same amount again on May 30. Prices of other grades were increased in accordance with the latest rise.

£16 More for Copper

An increase in price of electrolytic copper by £16, from £170 to £186 per ton delivered, was announced by the Ministry of Supply on June 6. This followed an increase in the U.S. prices the previous day. Copper has thus increased in value £22 in less than three weeks.

Further increases in the prices of U.S. zinc were announced on June 5.

Linseed Oil Prices

DURING the four-week period ending July 1, the following alterations in the prices of unrefined oils will apply: Linseed oil from £132 to £134 per ton; linseed oil foots from £82 to £84 per ton, both naked ex works. Prices of all other unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users will remain unchanged.

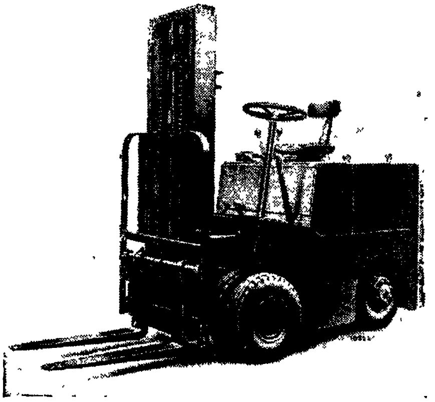
RAPID MECHANICAL HANDLING

Equipment of Interest to the Chemical Industries

MUCH of the equipment and apparatus on show at the second National Mechanical Handling Exhibition, which opened at Olympia, London, on June 6 and continues until June 17, is again of the type designed for the lifting and stacking of goods in packing cases, but there are also a number of exhibits of particular interest to the chemical industries requiring to handle raw materials in bulk.

The whole includes pneumatic lifting apparatus for use where the electrical types are unsuitable owing to the danger of sparks near explosive materials; fork lift trucks of a design already in use in a number of chemical works for handling drums; conveyors and exhaust apparatus for removing dust and fumes; instruments for the accurate measurement of liquids; a flameproof vibrator for use in explosive atmospheres in mines, etc.; and a light weight, high speed bag-filling machine, for packing nitrates and other chemicals.

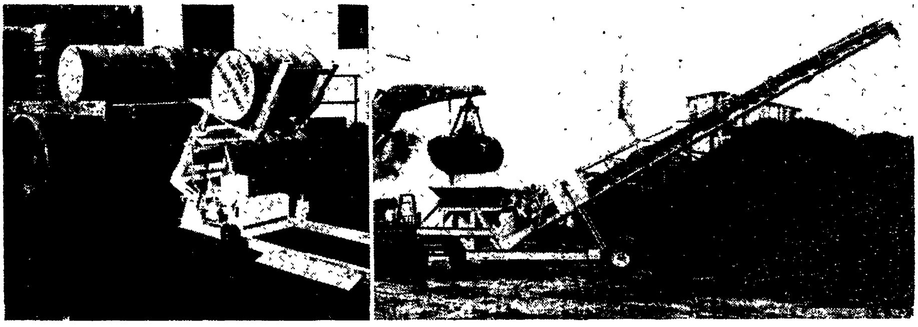
Mobile cranes, like the many kinds and designs of trucks exhibited, have been rendered still more manœuvrable in confined spaces. They can lift up to 20 tons, but a 12½-ton model with a 100 ft. jib, by Henry J. Coles, Ltd. (centre of Grand Hall), was the largest that could be brought into Olympia. Electronic control, to give precise positioning of lifting gear, was demonstrated at the 1948 Mechanical Handling Exhibition; now remote radio control of the movements of a crane or hoist is being employed.



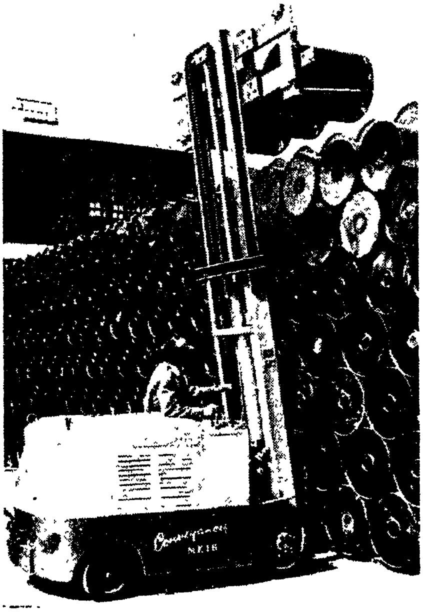
Electric fork truck, by Ransomes, Sims and Jeffries, Ltd., with telescopic lifting gear and tilting masts, which can lift 2 tons 10 ft. in under 10 seconds

Conveyors shown include at least one of new design for quicker operation, and the full-scale overhead chain conveyors being displayed, as used in production lines, are now being designed to carry loads of a few ounces or of over a ton. Here there are automatic means of shunting into "deadlines" or sidings for inspection, etc., and of unloading.

Delivery dates, for the filling of both home and overseas orders, are generally reported to be much more satisfactory



Mobile lorry loader by R. H. Corbett and Co., Ltd., which lifts and stacks in 5 sec. barrels, drums or crates weighing up to 7 cwt. which can be tilted through 90 degrees. Right: A 40-ft. stacker by Crone and Taylor, Ltd., handling coke at a gasworks; it can stack to a height of 20 ft.



Fork lift Conveyancer truck, by Electro-Hydraulics, Ltd., handling caustic soda at the General Chemicals Division works of I.C.I.

than in 1948, when the last exhibition of this kind was held and when the post-war production of many of the items of equipment now exhibited was in its early stages.

Among the many exhibits of the modern fork-lift truck is that of **Electro-Hydraulics, Ltd.** (Stand A.8 Grand Hall), which is showing the Conveyancer Mark II unit. This type is already in use at the works of the General Chemicals Division, I.C.I., and other large chemical centres. It has a capacity of 30 cwt. and lifting and lowering speeds of 9 ft. in 15 seconds. The maximum speed of the truck, forward or reverse, is approximately 10 m.p.h. Its overall width and length are, respectively, 38½ in. and 77 in. and its overall height telescoped is 79½ in. and fully extended 133½ in.

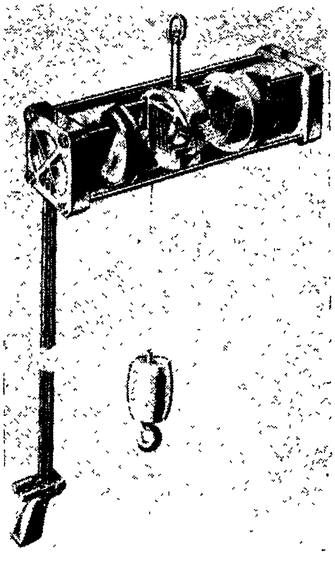
Lifting appartus of special interest to the chemical industry is displayed by **Marton Air Equipment, Ltd.** (Stand H 1c, National Hall). The Marton air hoist is being used in many chemical and other works where the electrical type of hoist cannot be employed owing to the risk of spark ignitions. Special features are the balance effect for easy positioning of load; the variable speed, from a creep to maximum at will, simply depending on the amount a push button is depressed. It is claimed that it cannot be damaged by overloading; there is no risk of fire; it is silent in operation and occupies the minimum of headroom.

A 15-ft. long working model of a railway marshalling yard is shown by **Moxey Conveyor and Transporter Co., Ltd.** (stand C 1, Grand Hall). Wagons are shunted on to a wagon tippler which tips into a concrete storage bunker which feeds a belt conveyor. This takes the material up to a junction tower and on to a washery building.

On the stand of **Fraser and Chalmers Engineering Works** (stand A.15) is a working model, one-eighth full size, of a wagon tippler. Also on show is electromagnetically operated vibrating equipment which separates, by means of a screen and also re-mixes two different sized materials (distinctively coloured for the demonstration).

The main exhibit of **Simon Handling Engineers, Ltd.** (stand B 10b) is a working pneumatic conveying plant handling, for demonstration purposes, a granular plastic material, at the rate of 5 tons an hour. The usual metal conveying pipes have been replaced by transparent pipes to show the material in motion.

A Lowerator shown by **Barron and Shepherd, Ltd.** (stand B 86) affords a spring compensated platform at normal operating height. As articles are placed



Air hoist by Marton Air Equipment, Ltd.

on the platform it descends according to the weight applied, but the spring compensation always keeps the top of the articles at the same operating height. A model at present being developed will carry a 3¾ ton load of steel bars. A roll-race conveyor, claimed to have the highest efficiency of any conveyor in the world, is being shown by this firm. It is a load-carrying belt running on a continuous roller-race, and can be silent in operation.

A new gravity conveyor on show by **Lamson Engineering Co., Ltd.** (stand B 38) weighs only 29 lb. an 8-ft. length but will carry a load of 150 lb., evenly distributed.

Claiming to be the largest designers and producers of pallets in this country, **Pallets, Ltd.** (stand F 7), shows a new paper-board expendable type. The firm claims that goods can be sent anywhere in the world by land, sea or air on these new pallets.

On show by **J. Stone and Co., Ltd.** (Stand B 9) are lightweight stillages of aluminium alloy cast in one piece. It is claimed that these are non-corrodable and can be cleaned with water or steam—an advantage in food and confectionery factories.

A mobile lorry loader which will lift a load of 7 cwt. to a height of 4 ft. 6 in. in five sec. is among the exhibits of **R. H. Corbett and Co., Ltd.** (stand C 14). Two versions of this model are shown, one for loading any barrel, drum, cask, bale or crate that can be tilted through 90°, and the other for "this side up" loads which must not be tilted. A barrel lifter and dispenser which lifts 2½ times its own weight is also on show.

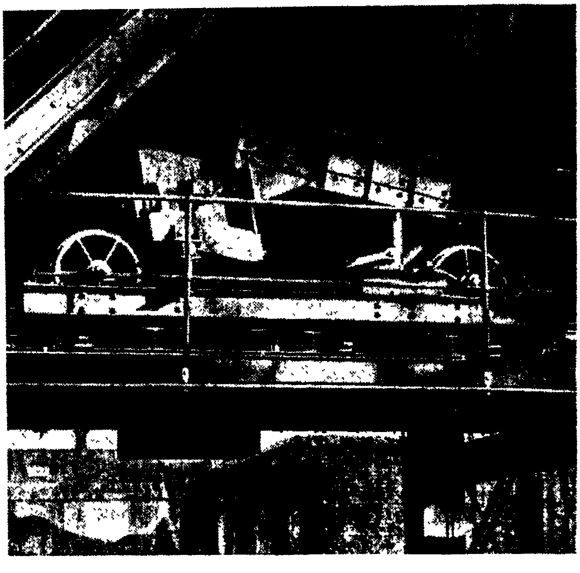
A 25-ft. stacker which will hump anything from 7 lb. packages up to 2 cwt. boxes is exhibited by **Crone and Taylor, Ltd.** (stand A 31). It is claimed that it has stacked 1000 ½-cwt. cartons per hour, with one man feeding and one man taking off, at a height of 16 ft. 8 in.

Chemical Concessions to Germany

RELAXATION of control over certain German chemicals announced this week marked an important stage in the progressive easing in the industrial field of the restrictions framed to ensure disarmament and demilitarisation.

The new regulations issued under the allied High Commission's law number 24 remove the restrictions on poison war chemicals with peacetime application, industrial explosives and their accessories, white phosphorus and chlorine. Strict control, however, is to be retained over war explosives, certain rocket fuel chemicals, and poison war gases not adaptable to peacetime uses.

Increased responsibility for administration of the law is given to German authorities who now, subject to the approval of the Military Security Board, may issue permits for the manufacture of a large class of war chemicals required for peace economy, such as industrial explosives, liquid oxygen, and ammunition for civil security and sporting purposes.



Sherwen electromagnetically-operated vibrating equipment, with 4 ft. by 18 ft. medium duty feeder. This is one of the exhibits of the Fraser & Chalmers Engineering Works

English Chemists in Holland

Cordial Reception of the Fine Chemicals Group

THE first overseas tour by the Fine Chemicals Group of the Society of Chemical Industry, May 6 to 13, afforded a party of 23 a memorable experience of the warm hospitality of Dutch chemists and of the advanced industrial chemistry and natural beauty of Holland. The party made the crossing to Amsterdam in two sections, by sea and by air, accompanied by Dr. F. Hartley and Dr. G. M. Dyson. A long and highly successful programme of visits to plants and laboratories and to a great many other places of general interest in Holland was arranged by Dr. Dyson and Prof. P. E. Verkade.

The English chemists and the seven ladies of the party were given an official reception in Amsterdam by the Nederlandsche Chemische Vereniging, and welcomed by Prof. H. J. C. Tendeloo (president of the Dutch Chemical Society) and Prof van der Linden and some 40 members of the Dutch Chemical Society.

Dutch Research Group

A visit on May 8 to the Royal Dutch-Shell laboratories at Amsterdam gave a valuable insight into the scope of the Shell research groups, described by Dr. G. H. Visser, director of new products research, and of the character and objectives of the Dutch research group. The visitors were able to see some of the work in progress on plant protection products and pesticides, the advanced spectroscopic equipment (ultra-violet and infra-red spectra) in the physico-chemical laboratories and the equally fine equipment for experimental distillation and studies of catalysis. Lunch and tea were provided in the laboratories.

The next visit of technical interest, after a wide programme of sightseeing tours, was on May 10 to the factory of N.V. Organon, at Oss, where the scientific director, Dr. M. Tanske, received the chemists and described some of the work going on. Films were shown illustrating the value of adreno-cortico trophic hormone (ACTH) manufactured by N.V. Organon, in the treatment of rheumatoid arthritis. After lunch, at which Mr. Saal van Zwanenburg, president of the company, welcomed the guests, parties under Dr. Lens, director of research, and Dr. Veer, director of the research institute, toured the laboratories and factory.

Among plant shown and processes described were those for the manufacture of oestrone, steroid hormones, ACTH, insulin, heparin, protein hydrolysate, DDT and liver extract. In the research laboratories experiments were in progress for the purification of vitamin B_{12}, the standardisation of ACTH and suprarenal extracts.

On May 11 the group travelled on to Venlo in south-east Holland, near to the German frontier, to visit the laboratories and works of Chemische Fabriek L. van der Grinten.

The English chemists were received, on May 12, at the Technische Hoogeschool by Professors Dr. G. Meyer, Dr. P. E. Verkade and their colleagues. The group held there the fifteenth meeting of the Fine Chemicals Group and its first overseas scientific meeting.

Dr. G. M. Dyson, in a lecture "Chemical Literature and Chemical Advancement," described the simplified system of nomenclature he has devised to facilitate and improve the efficiency of reference, classifications and indexing of chemical compounds. Professor Dr. P. E. Verkade gave an account of the research work carried out in his department on the alkoxy nitroanilines and discussed the relations between physico-chemical and biological properties in the series.

In the afternoon parties were conducted over the magnificent newly-equipped laboratories for inorganic and physical chemistry, organic chemistry and pilot plant work. The excellence of the technical university of Delft served to remind the group of the need for further action in Britain to cater for the training of chemical technologists.

On Friday evening the completion of the programme of the group was marked by a farewell dinner at Hotel Kurkaus, Scheveningen, to friends who had made the group's Holland tour so successful.

French Sulphur

The sulphur seam at Malvezy, near Narbonne (Aude), France, is being actively exploited. The seam is 40 m. thick and has an average content of 8 per cent sulphur. It is an opencast working and the work is fully mechanised. The ore is enriched by treatment to provide up to 85 per cent sulphur and then purified by fusion, giving, it is stated, a finished product of over 99 per cent purity. The refining plant is being increased to a daily capacity of 1200 tons.

EVALUATING THE SOLVENTS

Characteristics of Some New Materials for Plastics

From A CORRESPONDENT

A NUMBER of new solvents are now being made available to the plastics industry for use in formulating adhesives, protective coatings and numerous plastic compositions for forming, spinning and spreading. An important result of the development of new organosol techniques, in which high solids suspensions of special fine-particle grades of vinyl resins are made in solvent systems containing large proportions of hydrocarbon diluents, has been the creation of new demands for solvents.

Some of these solvents are of special value in the processing of the newer polymers, *e.g.*, methylal (dimethoxy methane), a chemical with broad solvent properties, and an effective solvent for polystyrene, ethyl cellulose, polyvinyl alcohol and cellulose propionate. The five-membered cyclic ether, tetrahydrofuran, is a very effective solvent for polyvinyl chloride type resins and succinonitrile is a solvent for poly-acrylo-nitrile, now being extensively developed as a fibre-forming resin.

Resin Solvents

Some of these new fluids are very active solvents for specific resins, *e.g.*, isophorone is one of the most powerful solvents for nitrocellulose. This cyclic ketone is also a very good solvent for vinyl co-polymers, such as Vinylite. The unsaturated ketone, mesityl oxide, is another powerful solvent for nitrocellulose and ethyl cellulose and dissolves low-viscosity cellulose acetate. It is one of the most satisfactory solvents for polyvinyl chloride and is effective with high molecular weight vinyl co-polymer resins.

The range of new solvents includes many latent solvents which can be used to extend other solvents. Methylal, for example, possesses outstanding latent solvency for nitrocellulose and the vinyl resins, or as a latent solvent to extend acetone and the esters when a low boiling solvent is required. Lower viscosities and higher dilution ratios result.

It is not uncommon to find that active solvents for some resinous compounds are important latent solvents for others; methyl isobutyl carbinol is a good solvent for ethyl cellulose and an excellent latent solvent for cellulose esters, particularly nitrocellulose.

A large number of hydrocarbon diluents, including aromatic, aliphatic and naphthenic hydrocarbons, are now available to the plastics industry as non-solvents or diluents. The cycloparaffins, for example, cyclopentane, possess solvent powers intermediate to those of the corresponding aromatics and paraffins. The usefulness of many solvents depends to a large degree upon miscibility and rate of dilution with cheap non-solvents.

Efficient Commercial Vehicles

In the formation of solvent-systems for plastics end uses it is usual to employ several actual solvents, carefully selected and balanced to provide the most efficient and economical vehicle. For nitrocellulose paper lacquers it is not uncommon to use five or six solvents, such as ethyl alcohol, butyl alcohol, toluene, ethyl acetate and butyl acetate. A typical blend of solvents for this application consists of 10 per cent ethyl alcohol, 10 per cent butyl alcohol, 50 per cent toluene, 10 per cent ethyl acetate and 20 per cent butyl acetate. Here the diluent, toluene, is carefully balanced by the relatively high percentage of the high boiling solvent, butyl acetate.

Some solvents are used to reduce viscosity, improve gloss, increase flow, etc. Acetonylacetone is employed as a high-boiling solvent in nitrocellulose and vinyl co-polymer resin solutions and has the unique property of greatly reducing their viscosity, even when present in small percentages.

Suitable Evaporation Rate

Some factors influencing choice of solvents for synthetic resins can be summarised as follows:—

1. One of the most important considerations in choosing a solvent for some specific purpose is to ensure that its evaporation rate is suitable for the application. Some solvents have a boiling point too low for certain types of applications, while others are practically non-volatile and have a high boiling point. In many paint and varnish and printing ink applications the evaporation rate of the solvent used largely determines the appearance of the applied film and the speed of operation.

In the coating or lacquering of paper with nitrocellulose compositions it is necessary to choose a solvent system to suit the speed of coating and drying conditions. For a high speed drying coating a solvent blend made up of low boiling solvents is needed. One of the new fast-evaporating solvents is nonyl acetate, which has a boiling point 87-92° C. (10 mm.), This has a high solvent power and should find application as a component of nitrocellulose and other lacquers and enamels.

In plastics manufacture, such as the development of organosol techniques, the intermediate to slow-evaporating solvents are of the greatest importance. Here the comparatively new solvent, di-isobutyl ketone, boiling range 111 to 117°C., is being used as one of the solvent constituents of vinyl co-polymer dispersions for the production of thin-walled articles by dipping. Slow-to very slow-evaporating liquids include such new alcohols as 4-tert-amyl cyclohexanol ($C_5H_{11}C_6H_{10}OH$), boiling range 244-252° C.

Degree of Solvency

2. Classification according to solvent strength is very difficult as it is not easy to determine the degree of solvency as applied to resinous substances other than nitrocellulose. The latter has been used as the standard for many years. Although attempts have been made to evolve dilution ratio tests using vinyl, acrylic and other plastics, there is, as yet, no well-established method which is widely applicable. It is generally considered that the only reliable guide to solvency is that indicated by experience, which sets out the cyclic and unsaturated ketones as being the most active solvents, followed by the nitroparaffins, aliphatic ketones, ether alcohols and aliphatic esters.

The alcohols are usually classed as latent solvents and the hydrocarbons as non-solvents or diluents. This rule of thumb method is at the best a very rough indication of solvency and excludes such compounds as the amines, some of which are quite promising solvents.

Solvents do not always run true to type and there are many exceptions to rules. Amyl ether is unlike ethyl ether in that in the presence of alcohol it does not display only solvent power for nitrocellulose.

Solvent balance is of considerable practical importance in planning solvent systems and careful thought needs to be given to the part to be played by each solvent in a mixture or blend. Too great a disparity in the evaporation rates of solvent constituents should be avoided to prevent violent changes in composition due to uneven loss from evaporation. Such changes are liable to cause defects in the plastics product.

3. High in the list of factors controlling the selection and use of new solvents is chemical stability, *i.e.*, ability to be used with other solvents and substances and to be stored without suffering changes in composition. Methylal, for instance, is superior to ether and acetone for certain solvent extraction processes because of its stability to alkaline conditions and its general stability to a *p*H of 3. It also enjoys an advantage over ether of forming only minute quantities of peroxides.

This tendency to form peroxides is unfortunately characteristic of many solvents, and limits their general application.

Dioxane, which is an excellent solvent for cellulose acetate, ethyl cellulose, benzyl cellulose and many other resins, tends to form peroxides which are explosive. It is, possible, however, to reduce the risk of peroxides by adding a small quantity of reducing agent to the ether.

4. A solvent needs to be economical in use, and here specific gravity can play an important part. Methyl ethyl ketone has an economic advantage over ester solvents, because of its lower specific gravity. The resultant higher volume/weight ratio permits a greater volume of finished product to be manufactured from a given weight of solvent. On the other hand, the aromatic hydrocarbons as a class have a much higher molecular weight than the aliphatic hydrocarbons; but, volume for volume, the aromatics show greater solvency and produce less viscous solutions.

In the search for new diluents attention is now being given to ethyl benzene, iso-propyl benzene and tert-butyl benzene, all of which are medium-fast-evaporating solvents possessing somewhat similar properties to toluene. Some interesting cyclic hydrocarbons produced in refinery cracking operations are low boiling-point diluents of considerable promise, one of the most interesting being cyclohexene, which boils at 83.2° C.

Indian Plastics

PLANS to develop the production in India of a wide variety of plastics goods will be considered at a meeting of manufacturers to be convened shortly by Mr. J. N. Iyer, the plastic expert and a member of the All-India Plastic Manufacturers' Association. Early arrangements for setting up a plastics factory in Guindy, near Madras, have just been completed by Mr. Iyer.

If plastic cabinets were manufactured in India with a common approved mould, he considered that the cost of radio sets could be brought within the means of the common man and there would be considerable saving of foreign exchange.

ETHYLENE BY PARTIAL COMBUSTION

Advances Proposed by U.S. Oil Experts

THE principal source of ethylene to-day are paraffinic hydrocarbons which are thermally cracked in externally heated pipe stills. Operating temperatures are high (1500-1750°F.) and call for the use of expensive chrome-nickel alloys in the cracker pipes. Moreover, the thermal efficiency of the process is low and considerable quantities of fuel gas are consumed.

It has long been predicted that successful processes can be developed for the autothermic cracking of ethane and propane to form ethylene. The underlying principle is the thermal balancing of the endothermic cracking reaction by burning a portion of the paraffinic feedstock with admixed oxygen. The need for heat transfer through expensive tubular units is thus avoided, and considerable savings can be effected in reactor construction.

The Leuna System

During the war years, at least one German installation was based on such a process. I. G. Farbenwerke Leuna cracked up to 18,000 tons per year of ethane by partial combustion with oxygen of Linde-Fränkl purity (about 95 per cent). The process was carried out at one-half atmosphere absolute pressure and in the presence of large ceramic surfaces which favour the preferential burning of by-product hydrogen in the presence of hydrocarbons, thus raising the overall yield.

The maximum cracker temperature was 1620°F., ethane/oxygen ratio was 3 : 1. A stoichiometric ethylene yield of 60-65 per cent was obtained in a once-through operation. The product gases contained up to 31 per cent ethylene, along with unconsumed ethane, by-product hydrogen, some combustion products (11 per cent carbon monoxide, 1-5 per cent carbon dioxide) and miscellaneous by-products in small quantities.

No Oxygen

Principal objection to the process has been the need for expensive oxygen and the operating vacuum which necessitates recompression of the product gases before they can be successfully separated.

That these objections can be readily overcome has recently been reported by R. M. Deanesley and C. H. Watkins, of Universal Oil Products Company. Their study of process variables in the autothermic cracking of lower hydrocarbons for the preferential production of ethylene leads them to suggest the use of air instead of oxygen and operation at superatmospheric pressures with consequent savings in overall compression charges.

The chief promise of the new process is indicated in its application to ethane. Being particularly refractory to dehydrogenation and cracking, this hydrocarbon requires peak processing temperatures (or else particularly high recycle ratios).

Proper ethane cracking, carried out at 1650-1750°F. imposes a severe problem on selection and maintenance of tube metal in the pipe still. At the same time, ethane pyrolysis necessitates the use of a feed low in methane and hydrogen content, thus setting a definite pre-purification problem in many cases.

Ethylene producers have therefore generally preferred to use more expensive, but less troublesome propane as feedstock to the cracker, continuing to relegate ethane to the rôle of a nearly worthless by-product of petroleum processing.

Deanesley and Watkins now find that cheap methane may actually serve to raise overall efficiency of ethane cracking in partial combustion processing. Serving itself as fuel, methane can be shown to reduce the quantity of ethane which must be burned to supply the necessary heat of reaction in the cracker.

Pre-heating

Most important, if air is to be used, is the degree of preheating imparted to the cracker feedstock. Obviously the hot pyrolysis products may be used to preheat the incoming charge by countercurrent heat exchange. In the overall operation additional heat will have to be supplied to the feedstock for the final boost to reaction temperature. But the heat needed for this purpose depends on the efficiency with which the preliminary heat exchange function has been effected.

Obviously, in an autothermic process, it is essential that a small heat load as possible be imposed on the reactor proper. The heat supply is derived from feed hydrocarbon which is partly burned instead of being wholly converted to useful ethylene.

By minimising the reactor heat load (by high degree of preheating), the amount of reagent which must be burned is thus kept low. At the same time the amount of diluent by-products—carbon dioxide, carbon monoxide, and nitrogen (if air is used) —depends on the amount of required combustion. By minimising the degree of burning, the ethylene recovery problem from the more concentrated reaction products is thus facilitated.

The underlying reactions for the ideal case of autothermic ethane pyrolysis at 1200°K are as follows:—

$C_2H_6+0.5\ O_2=C_2H_4+H_2O—24.97$ kcal. (1)
$0.724\ C_2H_6=0.724\ C_2H_4+0.724\ H_2+24.97$ kcal. (2)

This means that the maximum yield of ethylene which can possibly be obtained is 3.448 moles per mole of oxygen.

In actual practice, considerable amounts of hydrocarbon are simultaneously burned to carbon monoxide and dioxide. In their experimental set-up (which was thermochemically only 50-60 per cent efficient), Deanesley and Watkins found the following distribution of oxygen in the reaction products:—

For an oxygen/ethane ratio of 0.2: -16 per cent in CO, 22 per cent in CO_2, the remainder in H_2O. For an oxygen/ethane ratio of 0.45 the distribution of oxygen between these combustion products was in the ratio 11: 54: 35.

Pressure and Yields

The primary independent variable is the ratio of oxygen to hydrocarbon. Temperature conditions are determined thereby. It is, of course, necessary to adjust conditions with a view to obtaining a temperature of at least 1300°F. if satisfactory conversion is to be obtained.

The effect on the reaction of pressure below atmospheric conditions is very small. Above atmospheric pressure, a marked effect can be discerned on ethylene yield. Thus, at 70 per cent conversion, the yield is reduced by 5 per cent on going from 1 to 3 atmospheres.

Deanesly and Watkins find that the principal effect of pressure in ethane cracking is the formation of larger amounts of by-product methane while propane pyrolysis at elevated pressures will result in the formation of by-product ethane at the cost of ethylene. The selection of pressure is not set by chemical but rather by wholly economic considerations.

The autothermic process is particularly characterised by high permissible conversion (up to 96 per cent, with a corresponding overall yield of 60 per cent, has been obtained in the case of ethane cracking). In tubular cracking processes, per-pass conversion exceeding 50 per cent is not normally recommended. In such cracking, however, overall yields (based on ethane, not on total fuel gas) are higher than is possible in autothermic processing.

Even if air is used as the combustion agent, the reported ethylene concentration of the product gases is about the same as that obtained in tubular reactors. The processing problems—by means of low-temperature fractionation, hypersorption, etc., are therefore of the same order of magnitude in both instances.

As in all hydrocarbon pyrolysis processes, acetylene is also present in amounts ranging up to 3 per cent, depending on reaction conditions. If the gas is free of sulphur compounds, this nuisance product can be removed by preferential hydrogenation, *e.g.*, over a palladium-silica catalyst.

Small amounts of oxygenated by-products—aldehydes and organic acids, introduce a nuisance problem and a caustic wash of the partial combustion products is indicated in every case.

BRAZILIAN DOCTORS' VISIT

SEVEN eminent Brazilian doctors arrived on May 31, at Northolt to study the significant advances made recently by British scientists in the fight against leprosy. In this vital branch of tropical medicine, Britain leads the world.

The visitors, all specialists in leprosy, will be shown the two newly developed British drugs—Avlosulfon and Sulphetrone —which have been notably successful in the treatment of leprosy in Malaya, India, Nigeria and other countries.

While in Britain they will visit the Pharmaceuticals Division of I.C.I. and Burroughs Wellcome & Co.—which have pioneered the new drugs, and meet the research workers in London and Manchester who perfected them. The Ministry of Health is arranging a reception at which the leprologists will meet the foremost British authorities on leprosy and tropical diseases and tours, which will take them to the chief medical teaching and research institutions, have been organised.

Britain has a particular interest in the disease since about three of the five million who suffer from it live in the British Empire. In the last few years, new treatments based on British sulphone drugs have produced marked improvements in a number of cases which had previously been considered hopeless.

The visitors are: Dr. Orestes Diniz, Dr. Jose Moacyr de Alcantara Madeira, Dr. Nelson Souza Camos, Dr. Lineu Silvera, Dr. Ary Pinto Lippelt, Dr. Walter Hadler and Dr. Jose Pessoa Mendes.

RESEARCHES ON AIR POLLUTION

BCURA's Contribution

THE average rate at which insoluble matter is deposited from the atmosphere is, in London, about 240 tons/sq. mile/yr. In other industrial areas in Britain it is as much as 460 tons.

Those hard facts are recalled by the British Coal Utilisation Research Association in an article, " Atmospheric Pollution ", published in its quarterly gazette (9, 2-10), which recalls that, pre-war, Britain unquestionably led the way in the installation of gas-cleaning plant; but although our standards of technical operation bear comparison with any in the world, some of this plant has now become useless.

Installation may be difficult and costly, but it is by no means outside the range of current technical practice to devise equipment to reduce substantially the weight of the dust burden of the gases as they emerge from the stacks. To remove 60 per cent (by weight) of the dust burden may be easy; to remove 90 per cent may be practicable; to remove 99 per cent would probably be both difficult and expensive, even where sufficient space is available for installation of the plant. An immediate need is for a yardstick whereby the performance of a plant may be assessed.

BCURA has been asked to assist in devising means by which this measurement can be made, and its physics department has been concerned with this work.

The problem has been to obtain over a short period of time a representative sample of the dust burden of the stack gases, sufficient in quantity for physical and chemical examination.

High Efficiency

The department has devised a small portable instrument to extract the dust from a gas sample, with efficiency bordering on 100 per cent. The physical examination of the dust, however, is complicated by the predominance of very small particles for which no widely recognised methods of size measurement are available.

The BCURA report considers that a simple type of grit arrestor is the cyclone, in which the dust-laden gases enter at a tangent into a cylindrical chamber, usually with its axis vertical. The gas in the chamber is spun rapidly and the grit, hurled outwards by centrifugal force, reaches the walls and drops into a collecting hopper, while the cleaned gas escapes upwards through a central pipe. This equipment, it is noted, is efficient with the larger sizes of grit, but its extraction efficiency falls rapidly as the size of the particles decreases.

Small cyclones are more efficient and reach a lower limit of dust size, but have to be used in batteries. A recent development is to use a large number of very small cyclones.

Electrostatic precipitation can be more efficient than cyclone methods but may be more costly, the cost increasing steeply as the efficiency approaches 100 per cent. A plant operating at 99 per cent extraction efficiency would probably be about twice as large and twice as expensive as one of 90 per cent efficiency; moreover, some types of dust cannot be collected with efficiency approaching 100 per cent.

Gas Washing

Gas cleaning by washing can be highly efficient but has several disadvantages to offset its outstanding merit of removing most of the sulphur dioxide. To avoid corrosion of the plant and an acid discharge, it is necessary to use a suspension of chalk. When the grits have been washed down from the gas the problem remains of disposing of the sludge, the volume and weight of which greatly exceed that of the dry material.

A large power plant may consume 1000 tons of coal per week and the sulphur it contains may be sufficient to yield 20 tons of sulphur dioxide or 30 tons of sulphuric acid.

Although sulphur dioxide gas is harmful as an atmospheric contaminant, in favourable atmospheric conditions it will be dispersed by the winds, while it remains unconverted into sulphuric acid. The high concentrations of sulphate found in deposit gauges in industrial areas, however, indicate that a substantial fraction of sulphur emitted from chimneys is, in fact, converted into sulphuric acid and redeposited.

To combat grit emission, Leicester installed several years ago a powdered fuel plant at the power station in the centre of the city. The plant, however, raised the problem of handling and disposing of large quantities of dust collected. The erection of a plant to manufacture artificial stone provided an outlet for part of this material. Some has been used to cover household refuse.

World Sources and Production of Potash

Vast Quantities Await Economic Extraction

ESTIMATES of reserves of potassium have been made only for lake brines and deposits of water-soluble minerals. The most conservative estimates place the total world reserve of potash in these sources at approximately 5003 million tons, distributed as follows (in millions of tons of K_2O): Germany 2495, Palestine, Dead Sea 1143, U.S.S.R. 709, France 300, Spain 272, U.S.A. 84.

Some estimates of the German reserve are as high as 482,700 million tons of water-soluble potash. The figure for the U.S.S.R. relates to the deposits in the Solikamsk-Berezniki district and the former south-eastern Poland, but large deposits are known in other areas.

Phosphate Reserves

The known world reserve of phosphate rock and apatite is conservatively estimated 26,191 million tons, probably containing some 6400 million tons of phosphoric oxide, distributed as follows: U.S.A. 13,504, U.S.S.R. 7568, Tunisia 1500, Algeria 1016, French Morocco 1000, Brazil 572 Is. of the Pacific and Indian Ocean 182, Egypt 179, 23 countries 670.

The estimates do not include large quantities for which reasonably accurate data are not available.

The world capacity for production of potash from water-soluble sources in 1948-49 is estimated at approximately 4.2 million tons annually. Germany has the largest capacity, followed in order by the United States and France. The supply of potash is now rather below the demand, but this situation is expected soon to be remedied.

Large resources of nitrogen, phosphorus, and potassium are economically usable by present methods of recovery. Utilisation of additional huge resources of these elements awaits the development of improved processes and techniques.

The world production of raw phosphate in the year ended June 30, 1949, estimated at some 6,022,000 tons of phosphoric oxide, was sufficient to meet most demands and was approximately 60 per cent greater than the production in 1939. There is every indication that the supply will generally keep pace with the demand.

The capacity for chemically processing mineral phosphate into fertilisers is obscured by lack of information on some eastern European countries. In general, there is need of considerable increased capacity for making highly concentrated phosphates.

Water-soluble Deposits

Subterranean deposits of water-soluble minerals have supplied the greater portion of the world's fertiliser potassium for nearly 100 years. Use of these deposits is favoured by their large extent, low mining costs and the ease with which the ore can be processed, with little or no use of chemical reagents, into highly concentrated salts.

The ocean averages about 0.05 per cent of potash and contains some 6 times 10^{14} tons of K_2O. There is good prospect of the eventual development of economic processes for selective precipitation of potassium from sea water. One such process now in the pilot-plant scale, makes use of a regenerable organic precipitant.

The economic recovery of potassium from lake and subterranean brines is dependent on the simultaneous production of other chemicals.

Among the potential sources of potassium are the large deposits of potash-bearing rocks, such as alunite, lucite, feldspar, mica, glauconite, and some kinds of shales. Utilisation of these rocks has the disadvantage that the potash content, which rarely exceeds 12 per cent, is seldom amenable to concentration by physical means. Recovery of the potassium usually requires expensive chemical treatment and, with the exception of alunite, offers little opportunity for production of marketable co-products.

U.S. Potash Deposits

The glauconitic sand, Georgian shale, and wyomingite (lucite-phlogopitesanidine) deposits in the United States are estimated to contain some 778 million tons of potash. Other occurrences, some very large, include the lucite deposits of Italy and the alunite deposits of China, Korea, Transcarpathian Ukraine and Australia.

Minor, though often locally important, commercial sources of potassium include plant ash, fume and dust from cement kilns and blast furnaces, distillery waste, etc.

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* Abstracted from a paper presented by K. D. Jacob at the United Nations Scientific Conference on the Conservation and Utilisation of Resources, at Lake Success, New York, and republished in the *American Fertilizer* (112, No. 10, 26).

CHARACTERISTICS OF A COOLING PROCESS

Fundamentals of Controlled Exchange[*]

by LEO WALTER, A.M.I.Mech.E., M.Inst.F., A.M.I.H.V.E.

TEMPERATURE control for cooling processes is in effect heat flow control. The characteristics of any system which is to be controlled for temperature will accordingly include all the variables which can affect the temperature of the substance being processed, or which can affect the flow of the cooling medium. Some of these characteristics are inherent in the design of the plant itself, but there are others which are the result of variations outside the cooling process. These outside influences (usually designated "external characteristics") affect the final control of cooling and, consequently the choice of regulator type.

Heat Extraction

It will be clear that in every kind of cooling process any heat derived by heat transfer, from the process unit must affect the total cooling energy required. In most cooling processes heat extraction from the equipment is the process itself. Not only the amount of heat to be carried away by the cooling water flow in a given time, but also any change of cooling load influences the rate of heat extraction.

Temperature and Pressure Variation

Another "external" characteristic is a varying cooling water pressure. If a process plant is designed to use water at a pressure of 30 p.s.i., it can scarcely be called in "internal" characteristic (that is, a characteristic of the process) if the cooling water pressure varies between, say, 20 and 40 p.s.i.

The user must decide whether the process to be controlled calls for such close regulation as to make it necessary to eliminate variations in supply pressure (if this is possible), or to install more elaborate controllers which the varying supply would require. In this connection the size of supply mains is obviously important. If the size is inadequate for the required maximum rate of flow, loss of pressure within the plant unit may make the existing cooling surface incapable of meeting the maximum demand. An automatic temperature controller cannot correct this condition, which requires that the diameter of the supply main, or the supply pressure, should be increased.

Irregularities of cooling load may also add considerably to the duty of an automatic controller. Frequent and heavy load fluctuations of the process require stabilised controller types, particularly on chemical reaction vessels, scrubbers and towers with fluctuating output.

Internal Characteristics

The internal characteristics of the process requiring cooling are to a great extent a function of the plant design. Characteresitics which seem unfavourable to good temperature control can be made favourable by plant modification or a change in processing technique. Plant modifications, which might increase controllability of a cooling process might consist of change of the size of cooling surface, increase of water velocity by increased pressure head, or improved distribution of cooling water within the equipment. In all heat-flow processes, three factors, broadly, are involved:—

(1) Value of heat to be extracted (or added).
(2) Temperature difference.
(3) Time.

(1) *Total Heat.*—It is essential to know the heat value to be dissipated from the job, its "heat capacity". That can be determined by a calculation involving the weight of the substances being cooled, their specific heats and the temperature at which the cooled substance is treated.

(2) *Temperature difference.*—The rate at which heat will flow from a hot to a cooler substance depends primarily on the difference in temperature; the rate of heat flow will be greatest when the maximum disparity exists. Heat flow ceases when the temperatures coincide. For rough calculations, the "mean" temperature difference can be used between cooling water and cooled substance. Where the latter is a liquid or gas, the mean temperature will be different for counterflow or concurrent flow.

(3) *Time.*—The rate of heat flow, besides being determined by the temperature difference between cooling medium and cooled substance is affected also by the area of the surface over which the heat is being transmitted. Each cooling process

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[*] Previous articles on this theme by the same author appeared in THE CHEMICAL AGE, 62, 159 and 267.

has a definite "process reaction rate", which influences the choice of controller type. The heat capacity of the material being cooled is often referred to as the "cooling demand side" capacity and that of the cooling medium as the "supply side" capacity. These capacities and also the cooling surface can be shown in simple diagram form which can be made to apply to any heat-transfer process.

When the capacities of a cooling process are so proportioned that the inherent self-regulation is inadequate to hold the temperature within permissable limits, the process calls for temperature control, manual or automatic. Self-regulation is the tendency to restore heat balance, which has been disturbed.

Change of Capacity and Controllability

In many processes, the capacity (amount of stored heat) changes at different stages of the process. A simple example is a water-cooled storage vessel in which the demand side capacity, varies according to draw-off of cooled liquid. Demand side capacity (for cooling) may at times be high, but may become low during storage periods. Such change may, of course, be quick or slow, according to existing process reation rate.

While the cooling surface and supply side capacity must be adequate for full load conditions, both will be oversized when the load is low. It is here that automatic cooling control plays its part.

It is possible the the same percentage change in demand may have much less effect on the water flow temperature than the same percentage change in the cooling supply. The reason is that the quantity of heat involved in a 1 per cent change in supply capacity (i.e., cooling water flow) may be 20 times greater than a 1 per cent change on the demand side (cooled substances).

The low load condition gives the cooler an unfavourable demand side capacity. Such a process characteristic, or such changes of conditions during a process, call for careful consideration when installing automatic temperature control, and usually they require power-operated gradual controller types.

The speed at which a change in temperature can be checked and the original temperature restored depends upon the process capacity lags and the lag in heat transfer across the cooling surface. A change in heat extraction is brought about by increasing the temperature difference across the cooling surface: in other words, by lowering the mean temperature at the cooling surface on the supply side.

This, of course, automatically increases the supply side capacity—the rate of flow of cooling water becomes excessive. If the supply side capacity then becomes too great in relation to that of the demand side, the residual cooling effect at the supply side will cause an underrun of temperature at the demand side after the required temperature has been attained. If the heat transfer now indicated should be retarded by a lag accross the transfer surface the underrun will tend to be even greater.

A relatively small supply side capacity, on the other hand, would retard the recovery of the demand side temperature but would also reduce the temperature underrun when the required temperature has been reached. All these factors influence the accuracy of control.

A typical example for a difficult control problem, due to extremely small supply side capacity, is a film-type heat exchanger, capable of being used for chemical reactions, as condenser, or for cooling of jacket water from IC.

In such vertical exchangers the cooling water from the top chamber is distributed in a thin film against the inner tube walls and baffles in the shell produce high velocities and relatively high heat transfer. The volume of the thin films of cooling water is much smaller than the liquid to be cooled, or the heat content of gases to be condensed, and any decrease of heat makes necessary a very vigorous change of thickness of water film and input. Controllability of this otherwise efficient apparatus is low, and stabilised controller types will be required for achieving satisfactory temperature control.

(To be continued)

Nitrogen-Free CO_2

A FRESH application of the fluidised bed principle, used with marked success to produce high-octane petroleum, is claimed in the U.S.A. to yield highly pure carbon dioxide. Workers of the Massachusetts Institute of Technology (W. K. Lewis, E. R. Gilliard and M. P. Sweeney) described at the recent Boston meeting of the American Institute of Chemical Engineers the making of nitrogen-free CO_2 by reacing coke with iron ore, the latter providing relatively pure oxygen to unite with the carbon of the coke. The two materials, in powder form, are fluidised during the reaction by a stream of pure CO_2. The used ore, stored, regenerates itself naturally. A further development of the fluidised bed reported at the same meeting by workers of E.I. du Pont is a small electrical probe which records any irregularities, bubbles or conglomerations in the powder stream.

PHOTOMETRIC STUDIES OF CEMENT

Simplified U.S. Method of Alkali Determination

THE content of sodium and potassium oxides in portland cement seriously limits its use in several directions. For example, where the cement is to be combined with crushed rock or gravel to make concrete, the alkalis may react with soluble silica present in the aggregates. This causes expansion of the concrete, resulting in the formation of cracks and weakening of the structure.

While it is highly necessary that the alkali oxides in portland cement and raw materials should be accurately determined, the usual gravimetric procedures for doing this are wasteful of time and require the services of specially trained technicians. Seeking a more convenient and practicable analytical procedure, W. R. Eubank and R. H. Bogue, of the U.S. National Bureau of Standards, recently completed an extensive study of the method of flame photometry. Their results indicate that this technique holds considerable promise for the rapid and accurate determination of alkalis in portland cement.

The method has now been adopted by the U.S. Federal Specifications Board as an Alternate Standard, and by the American Society for Testing Materials as a Tentative Standard, for the determination of Na_2O and K_2O in portland cement.

In the method of flame photometry, the solution to be analysed is directed in a highly atomised state into a flame. The light characteristic of each element to be determined is isolated, and its intensity is measured. In this way the principles of analytical spectroscopy are applied under conditions that allow rapid determinations to be made with relatively simple apparatus by people having only moderate training.

The Flame Photometer

In the bureau's investigation, a group of five cements was subjected to repeated analysis for Na_2O and K_2O by means of the flame photometer over a period of several weeks. The results, expressed as percentages of Na_2O and K_2O, were highly consistent. The standard deviation varied from 0.005 to 0.017 for Na_2O and from 0 to 0.023 for K_2O. The maximum spread for any cement was 0.05 per cent for Na_2O and 0.06 per cent for K_2O.

To determine how the human element affected these results, the flame-photometric data obtained on a series of cements by three operators using two different units of the instrument were compared. The average maximum variation from operator to operator was only 0.08 per cent for Na_2O and 0.04 per cent for K_2O. That relatively small discrepancy was considered evidence that a highly trained operator is not necessary.

A sample solution containing the cement constituents is poured into the photometer in which the light characteristics of the atomised material on meeting a methane flame are recorded on the scale in the face of the instrument

Use of the flame photometer in this work requires standard solutions of known alkali concentration, which provide the basis of reference in each determination. These must be so constituted that the excitations they produce in the flame are similar to those produced by the solutions to be analysed. The ideal standard solution would thus be composed of the same elements in about the same concentrations as the cement solutions to be analysed. Such standard solutions could be approximated by the addition of definite amounts of sodium and potassium chlorides to a cement solution having a known low alkali content.

There are, however, serious objections to the use of a cement for making up the standard solutions. In the first place, cements containing less than 0.1 per cent of both Na_2O and K_2O are not commonly available. Furthermore, any error in the content of those oxides as determined gravimetrically would be reflected in all subsequent photometric determinations. Lithium oxide, if present, will introduce an error in the gravimetric value for Na_2O, which, as commonly determined, includes any Li_2O that is present.

A series of standard solutions was therefore prepared containing calcium ion and hydrochloric acid in approximately the same concentration as would occur in the solutions of portland cement to be analysed. When these standard solutions were used the values for Na_2O and K_2O obtained with the flame photometer were in excellent agreement with those obtained by gravimetric analysis. The bureau is therefore recommending the CaO-HCL solutions as standards in this technique.

An important consideration in using the flame photometer is that the gas must be of constant composition and pressure and free from materials that may interefere with the spectral emission. For alkali determination it should also provide a flame temperature that will readily excite the alkali elements without affecting other elements that require higher temperatures for excitation. Propane was found to be nearly ideal for exciting the alkali elements with a minimum of interference from other causes.

The internal-standard procedure, often employed in spectrographic determinations, is sometimes used with the flame photometer. In this, employing a dual optical system, the emitted light-intensity ratios of the element sought and of another element introduced in known concentrations are measured, rather than the absolute light intensities of the element sought, as in the direct-intensity method. The disturbing effects caused by gas and air-pressure fluctuations, the presence of foreign ions and molecules and viscosity differences are thus minimised. The bureau made a comparative study of the relative advantages of the two procedures.

In either case the flame-photometric results compared with the values obtained by gravimetric analysis. However, the bureau does not recommend the internal standard method for determination of the alkali oxides in portland cement. Its weakness lies in the introduction of a fixed amount of lithium to both the standard and unknown solutions in order to obtain intensity ratios of the alkali elements to the standard. As lithium is unfortunately present in some raw materials that may be used in cement manufacture, the reliability of the internal standard method would be uncertain.

New Analytical Method for Aluminium

THE usual method for polarographic determination of aluminium depends on the direct reduction of the ion in a slightly acid solution.

This has the disadvantages that the adjustment of hydrogen ion concentration must be made very carefully, that many substances interfere and that the measurement of concentration is difficult to make accurately.

A new method, depending on a catalytic reduction in the presence of a large excess of bromate, was described by Dr. G. Jessop in a paper presented to the Physical Methods Group of the Society of Public Analysts at a recent meeting held at Cambridge.

The reduction curve obtained by this system occurred at a comparatively low potential and was not seriously affected by small variations in the hydrogen ion concentration.

Interference by other substances was less than in the usual method and the measurement of aluminium concentration could be made more accurately.

Satisfactory results could be obtained in the presence of nitrate or iodate, but with these the conditions had to be regulated much more carefully than with bromate.

The record gave two steps at -0.85 v. and -0.78 v. *versus* the saturated calomel electrode in 0.1 mole potassium chloride. The second step is used for the measurement of aluminium. The first is due to hydrogen ion and disappears at about *p*H 4, but at this acidity the aluminium step is not suitable for quantitative measurement.

Satisfactory results were obtained with concentrations of aluminium between 0.01 and 0.5 mg. per ml. The height of the aluminium step was not quite linear with concentration over this range and a calibration curve was necessary.

Industrial Metal Uses

AN exhibition, arranged by the Institution of Metallurgists, will be opened at the Science Museum, South Kensington, from July 7 to September 30. The complete story of the extraction, refining and uses of industrial and rare metals will be illustrated by means of photographs, samples, apparatus and models. Admission to the exhibition will be free.

OVERSEAS CHEMISTRY AND INDUSTRY

COMPLEX CHEMICAL COMPOUNDS

Representative German Views

ONE of the most far ranging reviews of German contributions to contemporary themes of fundamental chemistry is presented in a recent issue of *Augewandte Chem.* (May 20, 62), which commemorates the 75th birthday of Prof. Paul Pfeiffer, one of Germany's principal workers in the field of chemical complexes.

Prof. Dr. Fr. Hein, of Jena University, reviews recent progress in the chemistry of inorganic complex compounds, distinguishing the normal from the "penetrative" (*durchdringend*) complexes, with correspondingly different kinds of electronic bonds. In the former (normal) complexes the ions and dipoles are attached electrostatically to the central ion, constituting in the Werner sense a uniformly active field of force. In the "penetrative" complexes polarisation is characteristic, and these are regarded by the author as the more typical complex compounds.

He treats at some length the carbonyl complexes (metallic) and their structure, hydrogen-or alcohol-combinations, and the nitrosyl compounds, with an interesting section on water-analogous solvent systems. As is well known in the case of water, in addition to simple hydration, complexes are formed with water as bond, and these aquo-complexes, in reaction with yet more water, tend to act as acids and split off protons, thus establishing equilibrium as hydroxo-complexes.

The analogy of this acid formation, *e.g.*, in such cases as boron trifluoride and tri- or tetra-chlorides of gold and platinum, with that of known acid anhydrides like SO_3, has suggested the idea of anhydro-acids, which require the action of water to yield aquo-acids as actual real acids. Among such anhydro-acids are to be included also the metal hydroxides. Other analogous examples are furnished by alcohol, liquid ammonia and sulphur dioxide.

Organo-Metal Compounds

The complex structure and formation of organo-metal compounds based on the phenyl-chrome complex, the relations between complex chemistry and intermetallic combinations, and hydrogen bonds in inorganic compounds of the higher series, are discussed.

In his paper on the chemistry of complex reactions in water and in liquid ammonia, Prof. Dr. O. Schmidtz-Dumont, of Bonn University, deals in more detail with reactions already noted by the previous author. The first part of the paper given here covers two groups of reactions—(a) in which the water molecule as such takes part, and (b) those in which H_3O^+ or OH^- is the real reactant or bonding medium.

Hydrate formation and addition compounds are discussed and the view is expressed that, despite the relatively small number of clearly understood or defined cases of addition hydrates, one conclusion is justified. This is that primarily they may be formed by the action of water on metal halogenides with molecular lattice (structure), and in some cases also with other types of structure; and again (probably) in reactions with non-metal halogenides, so long as the electronic valency of the central atom remains not entirely satisfied.

The author also discusses under the heading of aquo-reactions *Aquotisierung* various cationic or anionic acido-complexes.

Metal Powder Technology

THE production of fine metal powders by hydrogen reduction is the subject of a full-length study by M. Petrdlik, reproduced by *Hutnicke Listy*, (5, 3, 105-111). The author examines in detail the conditions for a complete reduction of the oxides of W, Mo, Fe, Ni, Co, Cu and Pb as a method of producing fine-grain metal powders.

The reduction is carried out in an electric tube furnace fitted with heating spirals and affording two temperature zones. The material to be reduced flows uninterruptedly through the furnace, while the reducing hydrogen flows in the opposite direction.

The author presents a method of calculating the water vapour concentration in the reducing atmosphere from the real conditions of the continuously working furnace, as well as a calculation of the composition of the intermediate products of reduction (of various degrees of oxidation) based on the oxidation number.

RISING OUTPUT IN NORWAY

Chemicals and the Five-Year Plan

CHEMICAL and allied industries in Norway made substantial progress last year. The nickel, aluminium and ferro-alloys industries now have a much higher output than before the war.

This is reported in *Foreign Trade* (7, Nos. 175, 830), by S. G. MacDonald, Commercial Secretary for Canada, writing from Oslo on the stimulus to Norwegian industry of the country's five-year rehabilitation plan.

150,000 Tons of Nitrogen

He records that the nitrogen industry is now geared to produce 150,000 tons annually, compared with less than 90,000 tons in 1948. A new superphosphate plant belonging to the Norske Zinkkompani has been completed and is in operation; the urea plant of Norsk Hydro is under construction and production is planned later in the year; and the Odda Smelteverk is extending its production of carbide.

The mineral oil refinery at Vallo, destroyed during the war, is now being rebuilt and should be in operation within a year.

Investments in the herring oil factories have expanded the capacity of the oils and fats industry by about 26,000 hectolitres per 24 hours, an increase of 10 to 15 per cent. Much of this expansion took place in 1949.

Large investments have been made in the wood-refining industries to rationalise production and to extend operations to more advanced stages of processing. Much new equipment has been purchased and installed, resulting in greater production and improved quality.

The capacity of the cement industry was increased some 10 per cent and it is anticipated that a quantity nearly equivalent to pre-war years will be available for export in 1950.

AUSTRIAN REVIVAL

Substantial Fertiliser Exports

AUSTRIA is making great efforts to expand and diversify her chemical production. According to recent Austrian Press reports, it has been possible to start the manufacture of several new products, including aluminium sulphate, an important material for Austria's large paper manufacturing industry. Output of this compound is stated to cover home requirements. Manufacture of aluminium acetate has been resumed. Other new products are sodium fluoride and sodium pyrophosphate.

The important Linz (Upper Austria) nitrogen works last year produced nearly 300,000 metric tons of nitro-chalk fertiliser and it is expected that output for the current year will aggregate about 360,000 metric tons. Exports last year totalled 211,500 metric tons, but if exports throughout this year can be held on the high level achieved in the first quarter—135,000 tons—the year's total will be in the neighbourhood of 550,000 metric tons.

Growing Markets

Exports are directed chiefly to Poland, Spain, Czechoslovakia, Jugoslavia, Holland, Greece, Sweden, Finland, France and Italy. There have been some shipments to the Near East and a recent contract provides for the shipment of 30,000 metric tons of nitro chalk to the southern part of Korea. Part of the payment will be made in U.S. dyestuffs, made available by the U.S. authorities.

The works has also taken up the manufacture of pharmaceutical products made formerly by the I.G. Farben group. Additional sulpha drugs and other specialities are to be introduced.

Current development plans are for the production of wetting agents and insecticides, additional chemical fertilisers, including ammonium sulphate, phosphate and compound fertiliser, and one based on peat. The board is planning to erect a sulphuric acid plant to employ gypsum.

Insecticides for the East

THE World Health Organisation, in a communication to member States in the East. requested them to facilitate the free flow of insecticides into and between their respective countries by the lifting of trade barriers. It also expressed its readiness to assist under-developed countries in embarking on the production of insecticides.

Following this assurance, Ceylon's director of medical and sanitary services has suggested the establishment in that country of a DDT factory. The Department of Industries, however, has questioned the feasibility of this as the raw material would have to be imported. The director further suggested that the Health Ministry should explore the possibility of acquiring for Ceylon, through the WHO, a monopoly of the production and sale of DDT in the East.

(continued at foot of next column)

DETECTING AMMONIA LEAKS

Some New Photo-Electric Methods

TYPICAL examples of the practical use of photo-electric methods in scientific instrumentation are provided by a number of recent equipment items. These include a smoke density indicator. Variations of this equipment are employed for a number of other purposes, such as the control of the turbidity of liquids, the detection of sediments in liquids, or detecting the presence of impurities such as carbon dioxide.

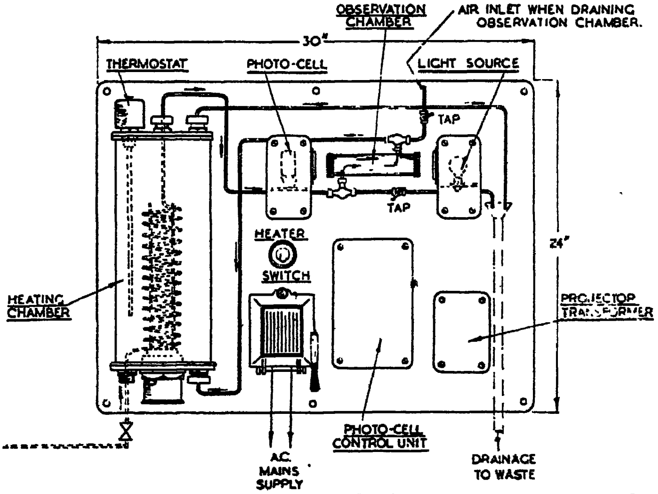
In the last case, a sample of the liquid would be continuously by-passed through a solution containing lime, when the presence of carbon dioxide would result in a cloudy appearance, the density of which, *i.e.*, the amount of carbon dioxide present, can be easily measured by the degree of obscuration of a beam of light projected through the liquid. The design of the equipment may be such that it can be arranged to ignore the presence of bubbles. In the event of the presence of excessive impurities, the equipment may be arranged automatically to shut down the plant when a predetermined figure is exceeded.

Similar principles have been adapted for the detection of ammonia leakage in air conditioning plant, where direct cooling of the spray water is accomplished by means of an ammonia system without an intermediate brine or cooling medium. Detection is based on the fact that water containing lime salts, particularly calcium carbonate (temporary hardness), becomes turbid when made alkaline with ammonia, especially at temperatures in the neighbourhood of 60° C. A sample of the water is therefore by-passed continuously from the chilled water system through a suitable heater and observation cell, where any change of turbidity is detected by a photo-electric light-sensitive cell and light-ray relay apparatus.

The water is heated by transit through a copper spiral immersed in a water jacket through which the heated water, after observation, is re-circulated and kept to the desired temperature by an adjustable thermostat and immersion electric heater. The heater is rated at 1500 watts, but is in circuit only intermittently, depending on the water input temperature and rate or flow required. The equipment normally deals with a flow of approximately 200 c.c. per min., raising this to a suitable re-action temperature from normal continuously, and under these conditions gives an alarm in less than one minute from the time at which ammonia-contaminated water enters the heating spiral.

The apparatus responds to ammonia concentrations barely perceptible by smell in the water and functions with very little attention and maintenance expense due to

(*continued overleaf*)



Showing the general arrangement of a contemporary ammonia leakage detector, which will give a continuous monitoring service and arrest the process or sound an alarm should a relatively small quantity of ammonia be present in cooling water

[Courtesy of Radiovisor Parent, Ltd.

Radio-Emission Gauging

*Principles of New Industrial Aids**

THE growing acceptance in many industrial processes of radioactivity measurement systems as a gauging appliance has gained further stimulus from some of the recent displays at the BIF and elsewhere.

A representative account of the character and capabilities is the technical description of the Ecko radioactive thickness gauge* which lends itself to the measurement and monitoring or continuous recording of metal or acrylic sheet. For thickness measurement it depends, at present, upon use of thallium$_{204}$.

The basic principles are these: By utilising the effect of the absorption of radioactive particles and rays in material an equipment may be constructed which can be calibrated in thickness for all forms of sheet or strip materials from very thin paper to thick sheet steel. There is no need for mechanical contact and the main advantages are apparent when it is used to measure material which is continuously flowing, *e.g.*, paper, plastics, brass, steel, etc. Several methods are available, three of which are of chief interest at present.

In the first, a single source and a single ionisation chamber are used. The material to be measured is placed between the two, and an electrometer connected to the ionisation chamber will show a current reading which, regarding the source strength and chamber geometry as a constant, will depend upon the mass of the material between them.

In the second and third methods, the standing ionisation current is cancelled out, by using respectively a stable reference potential or an identical source and chamber connected in opposition. The electrometer will now read the change in ionisation current caused by variations in the mass of the material being measured. In the second method a dial may be calibrated directly in weight and by means of a chart this can be translated into thickness. The third method is extremely useful when dealing with a long run of one type and thickness of material.

With any of these methods a sensitive current detector is required and this usually incorporates a d.c. amplifier. Due to the fact that zero drift of d.c. amplifiers is very high in relation to the minute currents to be measured, vibrating reed electrometers have been developed for this application and have much higher stability. Using such an electrometer, the drift per day will not exceed 0.5 per cent of the measured thickness.

The Ecko instrument which uses either the second or third principle, is a relatively new development and its full capabilities are not precisely ascertained.

The performance obtained with the standard equipment using thallium$_{204}$ as the source is said to be this:—

Material	Accuracy of Measurement for Stated Thicknesses	
	1 per cent	5 per cent
Paper and plastics	.005"—.036	0025"—.100
Aluminium ..	.0015"—.010	.0007"—.030
Steel	.0005"—.0035	.0008"—.010
Glass . ..	.0015"—.010	.0007"—.030

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* By Courtesy of E. K. Cole, Ltd., Electronics Division.

DETECTING AMMONIA LEAKS

(*continued from previous page*)

the fact that no re-action chemicals, etc., are necessary. The light source is a standard 6-volt 18-watt lamp, and no critical focus or optical adjustments are necessary. The contacts can be used to give audible or visible alarm, or stop the circulating pumps when a leakage of ammonia occurs. The standard apparatus normally contains contacts which close only so long as the water is clear and, in addition, open to safety if the lamp, valve or mains supply fails. Thus it is impossible to put the pumps in action if the detector is not in correct working order. The equipment will also act as a warning if the water in the circulating system becomes unduly dirty or discoloured.

An interesting example of this type of equipment is used for checking the turbidity of the 36 million gallons of beer produced annually by one of the largest British brewers. The " brightness ", i.e., clearness, of the beer, varies according to the type being brewed, but must closely conform to a standard.

For this reason, a " sample " by-pass pipe incorporating a glass tube leads from each main line, the tube passing between a powerful beam of light projected on to a photo-electric cell forming part of a turbidity indicator. In the remote event of impurities in the beer, the intensity of the light falling on the cell is reduced by the cloudiness of the beer, thus varying the amount of current produced by the cell.

• PERSONAL •

Mr. J. Brough

Mr. T. H. **Redfern**, chairman and managing director of Redfern's Rubber Works, Ltd., was elected on June 1 as president of the Federation of British Rubber Manufacturers' Associations for 1950-51. He succeeds Mr. G. E. Beharrell, deputy chairman and managing director of the Dunlop Rubber Co., Ltd. Mr. Redfern has in the past 20 years served in many offices of the rubber manufacturers' organisations and was recently deputy chairman of the employers' side of the National Joint Industrial Council of the industry for three years and continues to serve as chairman of the Labour Relations Conference and as vice-president of the Research Association of British Rubber Manufacturers.

Lt-General Sir W. G. Lindsell, having found it necessary to curtail his activities, has relinquished the chairmanship of the board of Petrochemicals, Ltd. He will continue to be associated with the group as a director of Petrocarbon, Ltd., and Manchester Oil Refinery, Ltd. **Sir Robert Renwick** has been appointed a director and elected chairman of Petrochemicals, Ltd.

Mr. Leslie Graham, formerly marketing director, has been appointed deputy chairman of the Northern (N & C) Division of the National Coal Board in succession to **Mr. R. W. Parker** who has resumed his activities with the Scottish Divisional Board, from which he was temporarily detached.

Mr. J. S. Brough is the newly appointed manager of engineering to Monsanto Chemicals, Ltd. He has been acting as assistant manager of engineering since January and originally joined Monsanto as a chemical engineer at the Ruabon works in 1945. **Mr. W. M. Cooper**, who has been manager of engineering since 1946, becomes assistant to the managing director, to advise generally on engineering problems and to handle external engineering works in which the compay has become active.

The Minister of Supply has appointed **Sir William A. Stanier**, F.R.S., as chairman of the board of directors of Power Jets (Research & Development), Ltd., of which he has been a director since 1944. In 1942 Sir William, a past president of the Institution of Mechanical Engineers, was appointed scientific adviser to the Ministry of Production. He now holds this appointment with the Ministry of Supply as well as several other offices.

" Small Information Services in an Industrial Undertaking " is the subject of a paper to be read by **Mr. A. H. Raine**, of Brotherton & Co., Ltd., Leeds, at a northern branch meeting of ASLIB, at the Harris Public Library, Preston, on June 16, at 2.30 p.m. The chairman will be **Mr. R. Brightman**.

Sir Edward Appleton has been awarded the gold Albert Medal of the Royal Society of Arts for 1950 for " outstanding services to science and industrial research." The medal will be presented privately, in the autumn, by Princess Elizabeth, president of the society.

Evans Medical Supplies, Ltd., has appointed **Mr G. T. Randall Davies**, as export manager at the head office, Speke, Liverpool, and **Mr. A. K. Brien**, as overseas representative with headquarters in Cairo.

A dinner in honour of **Dr. L. J. Spencer**, who in October will have completed 50 years as editor of the *Mineralogical Magazine*, is to be given on November 2 by the Mineralogical Society. A presentation of a personal nature will be made.

Mr. C. Pinkham, manager of the publicity organisation of The General Electric Co., Ltd., is retiring on June 30, after 37 years with the company.

VERSATILE WELDING PLANT

Philips' Exhibits at Harrogate

SOME noteworthy innovations in welding plant will be displayed by Philips Electrical, Ltd., at the British Electrical Power Convention Exhibition, at Harrogate from June 19-23.

Of interest among these is a portable a.c. welding transformer, type E1381/1. It is a general-purpose plant, suitable for such applications as light and medium fabrications, sheet-metal welding, maintenance work, etc. The welding current control is continuous over the range 15-200 amp.

Compact and of rigid construction, it is a mobile equipment, easily wheeled wherever it is needed. For continuous welding it is suitable for use with 10 to 18 SWG electrodes; for intermittent welding it requires 8 SWG electrodes. Input links enable the equipment to be easily adjusted to 200, 225, 400 and 440 volts, on single phase supplies or between two phases of a 3-phase system.

Portable Welding Transformer

A high-capacity welding transformer, type 1368, also being shown, has infinitely variable adjustment over the current ranges 70-170 amp. and 170-350 amp. Also portable, it is suitable for use with electrodes from 12 SWG to 5/16 in. and is for light, medium and heavy fabrications.

Philips 56 is a low-hydrogen electrode, designed for the welding of low alloy, high tensile steels. The lime-fluorspar coating makes the electrode insenstive to carbon and sulphur in the base material, so that sound and clean welds are obtained. The mechanical properties obtained are: 36 tons/sq. in. ultimate strength; 35 per cent elongation on 2 in.; 80 per cent reduction of area; and 90 ft./lb. Izod impact value. Because of the very low hydrogen content of the weld metal, very little weld metal/parent metal junction cracking can occur, even with relatively highly alloyed steels. Weld metal with good impact properties at —70°C. can be produced.

The RSM electrode is for the welding of highly-alloyed austenitic chromium nickel steels of the stainless steel types, containing about 18 per cent chromium and 8 per cent nickel. The presence of 3 per cent molybdenum makes it suitable for the welding of stainless steels containing molybdenum in small quantities, or as in FMB, etc. This electrode is said to be of value in applications where high resistance to acid corrosion is needed, as in the chemical industry.

TECHNICAL PUBLICATIONS

New Laboratory Appliances

SOME of the latest trends in weighing technique are exemplified in new models of Stanton balances described by Griffin & Tatlock, Ltd., in a leaflet now available. Other leaflets just issued by this company cover a universal laboratory stirrer incorporating many new features; Pyrex brand ⅝ in. bore glass pipe lines for permanent laboratory installations; and a cylindrical design oven for drying, incubating or sterilising with automatic temperature control over the range of 35-220° C.

* * *

TO meet industrial demands for pressure and vacuum processes, a new pressure control instrument, suitable for low, medium or high pressure duty has been developed by the British Thermostat Co., Ltd. This is the Teddington Type QY, described in the company's leaflet N.S.17. The instrument is supplied with three standard adjustable ranges between the limits of 28 in. Hg. vac. and 250 p.s.i. Range adjustment is outside the case; inside, and easily accessible, are the calibrated range scale and a graduated differential adjustment.

* * *

WORLD statistics of copper, lead, zinc, tin, antimony, cadmium, cobalt, nickel, aluminium, magnesium, silver and gold are presented in a new 168-page book, "Statistiques—1948", published in Paris by the French company, Minerais et Metaux. Data in most cases provide a record since 1913 and prices are chartered for the period 1913-48. Leading producers of the different metals and brand names listed. The explanatory text is written in French. Copies of this book are being distributed by Intsel Metals Corporation, 70 Pine Street, New York City.

* * *

TALL oil rosin acids and their use for paper sizing are discussed by Svig Johanson, the Research Laboratory, Ornsköldsvik, Sweden in *Svensk Pappers Tidning* (Swedish Paper Journal, Vol. 53, No. 10), official organ of the Swedish Paper Mills Association, Swedish Association of Paper and Cellulose Engineers, etc.

* * *

CHEMICALS and metals (including alloys other than ferro-alloys), unwrought, are included in the schedule of goods listed under a further Open General Licence (Notice to Importers No. 379) and amendments to previous notices effective from June 1, published in the *Board of Trade Journal* (Vol. 158 No. 2789).

· HOME ·

Duty Exemption

The Treasury has made an order exempting cerium oxide, pure, and 2-ethylhexyl alcohol from key industry duty for the period June 5 to June 30.

Coal Production

Output of coal in Britain last week was lower on account of the Whitsun holidays. The total was 3,089,800 tons compared with 4,069,500 tons in the previous week and 3,046,000 tons in Whitsun week last year. For the first time for over three years mining manpower has fallen below 700,000—to 699,800.

U.K. Light Metal Statistics

Ministry of Supply statistics relating to U.K. production, imports and consumption of light metals in March include the following (in long tons): Virgin aluminium: production 2662, imports 5561. Secondary aluminium: production 7745. Aluminium scrap arisings 8669; consumption 11,348. Aluminium fabrication 20,619; foil 977. Magnesium fabrication 336.

Summer School in Electron Microscopy

A summer school in electron microscopy will again be held this year in the Cavendish Laboratory, Cambridge. Lectures will deal with the fundamental theory and operating principles of the electron microscope. The school will be held from Tuesday, July 18 to Saturday, July 29, inclusive.

Ardil Fabrics

Fabrics manufactured from a mixture of the synthetic fibre Ardil and wool were shown to members of the Scottish Board for Industry when they visited the Ardeer works of Imperial Chemical Industries, Ltd., recently. I.C.I., Ltd., has produced attractive fashion fabrics from the material, on which exhaustive tests are still being made. A factory at Dumfries will permit large-scale manufacture of the fibre when testing is completed.

Penicillin by Helicopter

The only cargo carried by the world's first helicopter passenger service, inaugurated on June 1 between Liverpool and Cardiff, was a consignment of penicillin from Evans Medical Supplies, Liverpool, to a Cardiff hospital. The despatch was in the nature of an experiment by Evans, which may lead to regular use of the helicopter service. The company's headquarters are close to Speke Airport and large quantities of medical supplies are regularly sent by air.

Toxic Effect of Extinguisher

The use of a chemical extinguisher to subdue a blaze in a test oven at Manchester Oil Refinery, at Trafford Park, was believed to have produced phosgene gas, the effects of which necessitated 30 research and drawing office staff being taken to hospital. Nine were detained.

Disputes in 1949

Industrial disputes in the chemical and allied trades caused six new work stoppages in 1949. The number of workers involved in all stoppages was 500 and there was an aggregate of 2000 days lost. These figures are low in comparison with most other industries.

Higher Bitumen Prices

An increase in the price of their proprietary brands of bitumen was announced by Shell Mex and B.P., Ltd., last Monday (June 5). The cost of Mexphalte was advanced by 7s. 6d. a ton and Shelphalt by ⅜d. per gallon. Recent advances in world oil prices and increased costs of distribution are stated to be the cause of the rises.

Finsbury Technical College

Members of the Finsbury Technical College Old Students' Association are requested to communicate with the hon. treasurer, Mr. W. B. Thompson, "Elleray," Regent Road, Altrincham, Cheshire. The intention is to hold a final re-union and a winding-up meeting to decide means for disposal of the funds, amounting to £533.

Europe's Largest Oil Refinery

Mr. Philip Noel-Baker, Minister of Fuel, and Mr. R. A. Carder, chairman of the Anglo-American Oil Co., last week visited the site of the £37.5 million Esso oil refinery at Fawley, Southampton, which is expected to have an output of 5.5 million tons of petroleum products a year. Completion is not due until January 1952, but construction is so well advanced that some operations may be started in the last quarter of 1951.

Atomic Plant's Water Needs

The Rivers Dee and Clwyd Fishery Board on June 3 formed a sub-committee to take steps to oppose a scheme to take up to 20 million gal. of water from the Dee for the Ministry of Supply atomic energy plant at Capenhurst. The board is to invite local authorities concerned to join in the objection.

GREASE PRODUCTS

Profitable Recovery at Bradford

THE annual report of the Bradford Sewage Committee reveals that the sales of grease by the department from the Esholt Works amounted last year to £238,158, and fertiliser worth £22,158 was sold. During the past 42 years more than £8,660,000 has been received for grease products and fertiliser.

Research is being directed to finding additional markets for grease, in collaboration with several Government departments and trade organisations. Satisfactory business is reported from an arrangement with the largest grease firm in U.S.A., and it is thought that a wide field may exist in that market for a paler grease. Successful research has been made and trials on a plant scale are now being prepared.

An encouraging report has been received from the British Leather Manufacturers' Research Association, in whose laboratories samples of leather have been treated with the department's products and have proved indistinguishable from those dressed with the orthodox, but more expensive, types of grease.

Paints and Taxes

THE view that an increase in the price of paints throughout the industry as a whole is inevitable is contained in the statement by the chairman (Mr. B. J. Nicholson) to be presented at the 26th annual ordinary general meeting to be held in London this month.

Contributory factors were the increasing duties and taxes. It was not, in fact, generally appreciated that the recent increase of 9d. a gallon on hydrocarbon derivatives affected paint manufacture.

This increased duty, plus the tax on commercial vehicles and the increase of 3s. 4d. in the £ on rail charges and 7½ per cent on road transport charges would lead inevitably to rises in material costs.

New BAC Branches

THE Yorkshire Section of the BAC has been revived, with headquarters at Leeds. Dr. I. Pollak has been elected chairman, Mr. F. C. Collins, vice-chairman, Mr. F. Simpson, hon. secretary, and Mr. R. G. Allen, hon. treasurer. It is intended to set up branches in Sheffield, York and Hull, and probably in other centres.

Arrangements are also being made to promote the formation of a new section in South Wales, in connection with which a meeting is being held at the Mackworth Hotel, Swansea, on June 14.

NEW RUBBER INDUSTRIES

Domestic Goods and Oil

THE development of Ceylon's light industry will be taken a step further when a factory for the manufacture of rubber goods—shoes, flooring and bicycle tyres—starts production this month.

Capital for the new venture will come entirely from local investors, and the technical control will be supplied by two Chinese experts with long experience of rubber manufacture in Malaya.

A former executive of the Bata footwear group in Czechoslovakia, Mr. J. Cermak, has arrived to take charge of another rubber footwear factory in Colombo, for which machinery is expected in three or four months' time.

Hopes are entertained in Ceylon of entering the world rubber goods market soon on a large scale. At present Ceylon manufactures are being exported to Egypt, Belgium and Australia. Local manufacturers, seeking a protective tariff.

At least two more manufacturers will start large-scale production shortly. One will concentrate on foam rubber products. The threat of competition from Japan has now been eliminated by the recent decision to stop temporarily imports from Japan.

Meanwhile, experiments in the extraction of oil on a commercial scale from rubber seeds, now wasted, are to be resumed in the newly completed research laboratory at Katukurunda. Recent experiments at the Rubber Research Laboratory indicated a yield of 20 per cent oil—paint oil of high quality, according to Dr. A. Sundarlingam, Rubber Technologist. The commercial development has come to a temporary standstill because, says Dr. Sundarlingam, "now that rubber fetches higher prices people do not bother much about seed."

Canadian Synthetics Research

THAT Canada had $50 million to develop a synthetic rubber process, "then untried," to replace natural rubber when Singapore was lost to the Japanese was recalled by Mr. C. D. Howe, Canada's Minister of Trade and Commerce, speaking recently to graduates of the University of British Columbia. Since the war, he said, another $50 million had been devoted to the development of synthetic rubber raw materials and an indirect result had been the establishment of factories making fibreglass, anti-freeze, chlorine and base materials for plastics. Research, he declared, was making jobs available to thousands of Canadians.

• OVERSEAS •

Italian Mercury

Production of mercury in Italy last year, 1584 metric tons, was 16 per cent higher than the previous year's total.

U.S. Fuel Oil Additive

A new fuel oil additive, FOA-5X, developed by the Shell group in the U.S.A., was incorporated into domestic heating oils during 1949 and is said to have been very successful in eliminating clogging of filter screens.

More Polyethylene

The rising demand for polyethylene resins in the U.S.A. is recognised by the decision of the Union Carbide and Carbon Corporation to erect at South Charleston a new plant which will almost double the output of Bakelite polyethylene. It will operate before the end of next year.

Electro-Chemical Research

The planning committee of the Central Electric-Chemical Research Institute of India, at a recent meeting in Madras, tentatively decided that the new research institute should begin to operate at Karaikudi in 1952. The scheme for the establishment of the institute is expected to cost Rs. 4.5 million.

French Chemical Production

Sulphuric acid production in France dropped from 97,286 tons in February to 75,785 tons in March. Calcium carbide increased from 8000 to 10,852 tons, soda carbonate from 58,044 to 56,638 tons, caustic soda from 19,313 to 19,565 tons. Output of superphosphates fell from from 98,000 to 90,000 tons, and of nitrogen fertilisers from 16,800 to 15,800 tons. Powdered phosphates output, 5500 tons, was lower by 500 tons.

Lung Extract to Treat Tuberculosis

A treatment for pulmonary tuberculosis, which makes use of a chemical extract from the lung, has recently been reported in Italy, and is stated not to attack Koch's baccilli, but to have a specific action on the affected organ and to reconstitute tissue. Tests on the therapeutic, made since 1945 in a sanatorium near Rome, are said to have effected 12 cures. The formula was discovered by Antonio Damia, a chemist who worked on notes left him by a Sardinian chemist. Similar research has been carried out by two Milan scientists, who studied the theories of the Russians, Kazakov and Filatov, on the stimulating action of extracts from organs.

Indian Hard Coke Production

Because of an insufficient supply of hard coke, the Government of India has appointed a committee to study the problem and to suggest methods of meeting current and future demands.

Radioactive Isotopes

A special feature of the $1 million atomic medicine research centre, recently opened by the New York University of Rochester, is a laboratory for the handling of radioactive isotopes.

Records 7900° F.

A new recording device for measuring and controlling extremely high temperatures (up to 7900° F.) of the order encountered in atomic energy research, has been developed by the Brown Instruments Division of the Minneapolis-Honeywell Regulator Company, Philadelphia, U.S.A.

Soda Ash in Colombia

It is anticipated that the soda ash plant now under construction near Bogota will be in operation by the end of 1950. Productive capacity will be 100 tons of soda ash, 80 tons of caustic soda and 12 tons of refined bicarbonate per day. A complementary plant will produce approximately 200 tons of refined salt per day.

Indian Bauxite

Deposits of bauxite have been located by the Geological Survey of India in the Sambalpur district of Orissa. The reserves are estimated at approximately 800,000 tons. The investigation was undertaken with a view to starting an industry for the production of aluminium and alumina abrasives with the help of cheap hydro-electric power that is expected to be available in the near future from the Hirakudi project.

I.C.I. Expansion in Australia

Several new plants having recently begun production or scheduled to do so by September this year, are announced by Imperial Chemical Industries of Australia and New Zealand, Ltd. These include the £500,000 mechanisation and extension of the Nobel explosives plant at Deer Park, Victoria; manufacture of polyvinyl chloride and formaldehyde at Botany, New South Wales; and good progress of the extensions of the works and saltfields at Osborne, South Australia, where caustic soda is produced. Duplication of the plant at Osborne is now in progress at a cost of £2.5 million.

The Stock and Chemical Markets

STOCK markets have had their most active period this year, distinguished by a continued demand for industrial shares, more encouraging trade reports suggesting that many companies have reasonable prospects of being able to maintain their dividends, notwithstanding rising costs of materials. This assumption has been stimulated by reports that many companies have been able to increase turnover in export markets, although competition is growing.

The decision of British Nylon Spinners to reduce prices by over 20 per cent—evidence of expanding output and improved production facilities—is one such instance which is expected substantially to expand exports. Shares of the joint owners of British Nylon Spinners, I.C.I., Ltd., and Courtaulds, have not held their best recent levels. Imperial Chemical have eased to 40s. 10½d. at the time of writing, pending the annual meeting, from which the City expects news whether any fresh issue of capital is contemplated in the near future. Courtaulds after being 37s. 10½d. eased to 37s. 6d.

Monsanto Chemical showed firmness at 48s., and Fisons have risen further to 26s. 6d., the good yield attracting buyers. Elsewhere, the cut in dividend from 35 per cent to 10 per cent put Amber Chemical 2s. shares down sharply to 3s. 3d. F. W. Berk, however, strengthened to 15s. on the decision to distribute a share bonus of 50 per cent. Boake Roberts were 26s., Bowman Chemical 4s. shares 5s. 3d., Brotherton 10s. ordinary 19s. 6d., Pest Control 5s. shares 7s. 9d., L. B. Holliday 4½ per cent preference 19s. 9d., and W. J. Bush 5 per cent preference 22s. 3d. British Chemical & Biologicals 4 per cent preference were 16s. 6d., and Laporte Chemicals 5s. units changed hands up to 9s. 7½d.

Borax Consolidated rose to 53s. 3d., British Oxygen to 94s. 3d., United Glass Bottle put on 1s. 3d. at 73s. 9d., and there was good demand for Triplex Glass, which advanced to 23s. despite uncertainty whether the dividend will be increased at this stage. Turner & Newall were up to 84s. with the general trend of markets; United Molasses at 43s. 6d. reflected a little profit-taking, and the 4s. units of the Distillers Co. were unchanged at 18s. The view that soap rationing may be ended or modified shortly drew more attention to Lever & Unilever, which rallied to 41s. 3d. Lever N.V. were also better at 38s. 10½d.

British Xylonite fluctuated, but at 81s. 3d. were higher on balance, and shares of other companies with plastics interests were again more active, De La Rue at 25s. 9d., and British Industrial Plastics 2s. shares at 6s.

Iron and steels showed firmness, but gains were only moderate, the controversy over the Schuman plan for pooling Europe's steel and coal having had some disturbing effect. Guest Keen, however, further strengthened to 44s. 3d., and John Summers were firm at 28s. 9d. awaiting terms of the company's debenture issue. These debentures the City believes may have a right to early repayment if iron and steel were nationalised.

Boots Drug have been active around 50s. 3d., British Glues & Chemicals changed hands at the higher level of 21s. 3d. Beechams deferred moved up to 18s. 9d., and Associated Cement to 84s. 3d. Oils have been uncertain, Shell at 68s. 1½d. following publication of the full results, but Ultramar Oil were active up to close on 14s. at one time on rumours of increased output. The debentures, at 138, were substantially higher.

Market Reports

THE price position throughout the chemicals market remains steady with a tendency to be firmer, and the volume of business is satisfactory for the time of year. Changes have been comparatively few and mainly concerned with non-ferrous metal prices, further advances in copper and zinc having been notified recently. A fairly good inquiry for export has been maintained and interest has been well spread over most sections of the market. Chlorate of soda is in good request and supplies of soda ash are finding a ready outlet. The coal tar products market is without feature and the volume of business is of moderate dimensions.

MANCHESTER.—The Manchester chemical market has made a quietly steady recovery after the Whitsun holidays, so far as actual movement into consumption against contracts is concerned. The textile and other principal using industries are again calling for substantial deliveries of caustic soda and other alkalis, as well as potash, ammonia and magnesium compounds. A fair volume of new home and export buying has been reported. The undertone generally remains firm, with

(continued at foot of page 870)

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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

J. K. Innes & Co., Ltd., Carlisle, chemical engineers. (M., 10/6/50.) May 8, mortgage and charge to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on land with workshop at Kingmoor, Carlisle, with machinery, fixtures, etc.; also a general charge. *£600. April 15, 1949.

Lankro Chemicals, Ltd., Eccles. (M., 10/6/50.) May 5, £20,000 mort., to National Mutual Life Assurance Society; charged on leasehold property, Bentcliffe Works, Eccles, with plant and machinery. *£25,527. August 24, 1949.

Solartron Laboratory Instruments, Ltd., Kingston-on-Thames. (M., 10/6/50.) May 10, £150 debs., part of a series already reg. *£5,288. November 10, 1949.

Satisfactions

Durham Chemicals, Ltd. (formerly Newcastle-upon-Tyne Zinc Oxide Co., Ltd. and Ouseburn Trading Co., Ltd.), Sunderland. (M.S., 10/6/50.) Satisfaction May 11, of mortgage reg. Sept. 2, 1947.

Lankro Chemicals, Ltd., Eccles. (M.S., 10/6/50.) Satisfaction May 13, of mortgage reg. March 5, 1948.

Company News

F. W. Berk & Co., Ltd.

A final ordinary dividend of 25 per cent, making 42½ per cent for 1949 is recommended. This compares with 37½ per cent forecast in the prospectus of April last year. £50,123 has been transferred from profit and loss account to reserve for increased cost of replacements. An extra-ordinary general meeting will be held shortly to approve an increase of £50,000 in the ordinary capital, with which it is proposed to make a free issue of one ordinary share for each two ordinary shares now held.

Evans Medical Supplies, Ltd.

Payment is recommended of a preference dividend at 3 per cent less tax, for six months ending June 30, 1950.

Greeff-Chemicals Holdings, Ltd.

Group profit for 1949, before providing taxation, was £62,741 compared with £73,461 in 1948. After tax (£30,894) and placing £10,000 to reserve and payment of preference dividend, a final dividend of 8¾ per cent, plus a bonus of 3¼ per cent, making a total of 16 per cent, less tax, is recommended.

Jenson & Nicholson, Ltd.

A final distribution of 20 per cent on the ordinary shares is proposed and a balance of £28,503 is carried forward, compared with £26,986 in 1948.

Increases of Capital

The following increases in registered capital have been announced: Haffe Products, Ltd., from £20,000 to £25,000; Jencons (Scientific), Ltd., from £5000 to £9500.

New Registrations

Lea Valley Chemicals, Ltd.

Private company. (482,604). Capital £1000. Manufacturers of chemicals, gases, etc. Directors: H. Yarrow and F. Shamash. Reg. office: 46 Finsbury Square, E.C.2.

Thomson, Skinner & Hamilton (Edinburgh), Ltd.

Private company. (27,731). Capital £10,000. Chemical manufacturers and merchants, etc. Directors are not named.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

further advances in the zinc products, following the sharp rise in the metal price. Makers of sodium sulphide have increased quotations by 6s. a ton, while percarbonate and perborate of soda are dearer on balance by £1 a ton.

Glasgow.—There has been a definite slowing up of business during the past week owing to the fact that very few spot prices were available on account of the many and varied changes in price to be arranged following the increased cost of petrol and hydrocarbons and also the higher railway carriage rates. The export market shows definite signs of revival.

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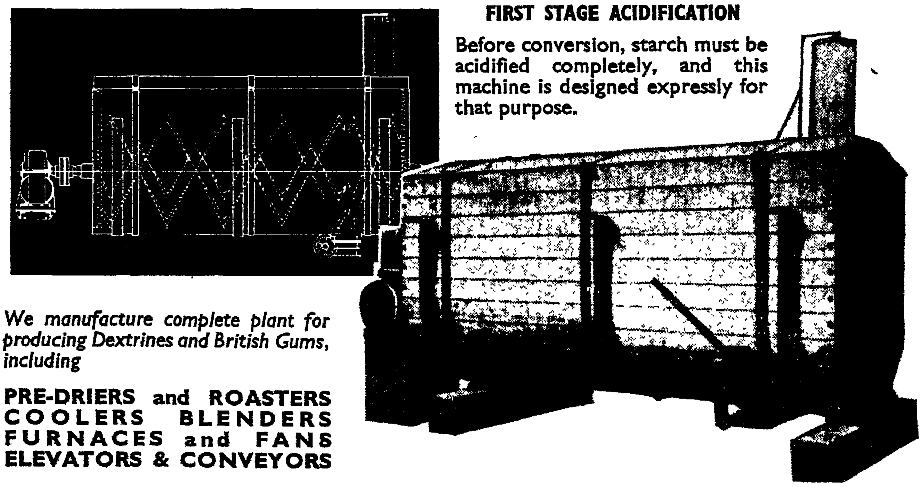

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Aminoanthraquinone sulphonamides.—General Aniline & Film Corporation. April 18 1947. 639,660.

Preparation of diamines.—Sterling Drug, Inc. May 19 1947. 639,853.

Purification of pteridines.—American Cyanamide Co. May 22 1947. 639,854.

Processes for the manufacture of alkali metal hydroxides, sulphur dioxide, and sulphuric acid.—C. W. Dorbach. May 23 1947. 639,855.

Process for the production of fertilisers.—Potasse et Engrais Chimiques. June 5 1947. 639,783.

Methods of preparing 7-halogensterol-esters and 7-dehydrosterols.—N.V. Philips' Gloeilampenfabrieken. July 7 1947. 639,726.

Selective calcination of dolomite.—Dorr Co. July 8 1947. 639,668.

Processes and media for the production of streptomycin and other antibiotics.—Heyden Chemical Corporation. July 14 1947. 639,863.

Polymerising substances in the emulsified state.—N.V. De Bataafsche Petroleum Maatschappij. July 23 1947. 639,729.

Manufacture of copperable polyazo dyestuffs.—J. R. Geigy A.G. Aug. 1 1947. 639,860.

Method of rendering aluminium resistant to attack by hydrogen peroxide.—Pennsylvania Salt Manufacturing Co. Aug. 6 1947. 639,730.

Anti-foaming composition.—Dow Corning Corporation. Aug. 15 1947. 639,673.

Ethers containing a saturated carbon ring.—G. B. May, and J. W. Fisher. Aug. 20 1948. 639,733.

Protection of ferrous metal surfaces subject to contact with hot furnace gases.—W. E. Ballard, and W. F. Harlow. Aug. 30 1948. 639,676.

Dehydration of methyl ethyl ketone by distillation.—Standard Oil Development Co. Sept. 9 1947. 639,734.

Process for producing mono-alkylbenzenes, and the mono-alkylbenzenes resulting from said process.—Monsanto Chemical Co. Oct. 8 1947. 639,873.

Production of guanidine sulphates.—American Cyanamid Co. Nov. 3 1947. 639,681.

Process for removing cobalt from zinc electrolytes.—Hudson Bay Mining & Smelting Co., Ltd. Nov. 19 1947. 639,685.

Manufacture of cellulosic paper.—Bakelite Corporation. Dec. 13 1947. 639,884.

Process for the preparation of urethane derivatives of the lysergic acid ring system.—Sandoz, Ltd. Dec. 17 1947. 639,887.

Manufacture of aldehydes from ketones to β-ionone.—Roche Products, Ltd. (F. Hoffmann-La Roche & Co., A.G.). Nov. 24 1948. 639,888.

Nylon compositions.—I.C.I., Ltd. Dec. 30 1947. 639,893.

Heat-treatment of magnesium base alloys.—Magnesium Elektron, Ltd., C. J. P. Ball, A. C. Jessup, and P. A. Fisher. Dec. 16 1948. 639,808.

Detergent compositions.—P. Lunt & Co., Ltd., and J. H. Wootton-Davies. Feb. 4 1949. 639,630.

2-furoic amides of amino naphthols.—General Aniline & Film Corporation. Feb. 18 1948. 639,697.

Methods for controlling the flow of particulate solids.—I.C.I., Ltd., and E. J. Challis. March 1 1949. 639,636.

Production of articles of synthetic resinous materials.—I.C.I., Ltd., W. E. F. Gates, and A. L. L. Tompsett. Feb. 4 1949. 639,918.

Anti-corrosion oils.—Shell Refining & Marketing Co., Ltd., G. D. Galvin, and A. E. McAulay. March 12 1948. 639,814.

Preparation of substituted pteridines and intermediates thereof.—American Cyanamid Co. July 26 1946. 640,092.

Process for extracting alumina from calcium aluminates.—J. C. Seailles. Aug. 28 1946. 640,145.

Polycarboxylic acids and method of preparing the same.—B. F. Goodrich Co. Sept. 6 1946. 639,929.

Aliphatic sulphur compounds and compositions containing same.—California Research Corporation. Oct. 22 1946. 640,148.

Process of manufacturing a citrate soluble phosphatic compound, useful as a fertiliser or an ingredient thereof.—Directie Van De Staatsmijnen in Limburg. Nov. 5 1946. 640,149.

Process of manufacturing a citrate soluble phosphatic compound, useful as a fertiliser or a fertiliser ingredient.—Directie Van De Staatsmijnen in Limburg, H. De Bruijn, and M. H. R. J. Plusje. Dec. 5 1946. 640,237.

Water-repelling organo-silicon products.—Soc. Des Usines Chimiques Rhone-Poulenc. April 11 1947. 640,162.

The
Chemical Age

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Safeguarding Medical Invention

THE great growth of invention in biological materials and medicines in general has been one of the outstanding facts in the broad field of chemistry since the war. The useful preparation in its final form almost invariably has owed much to the work of chemists and biochemists, even in those instances where the initiative derived from a medical practitioner or, more frequently, a medical research worker.

To the large chemical organisations from which come most of these healing materials the protection afforded by the Patent Office is an essential condition for profitable and progressive activity. No such protection can, however, be invoked by the medical man who may isolate a valuable new material and perhaps indicate the route by which it can be made available. By an admirable but antiquated canon of medical ethics no medical man may patent his discovery. That principle, which is a great deal older than the resolutions in 1903 and 1920 of the Central Ethical Committee of the British Medical Association which made it obligatory, has now been reconsidered and the adverse evidence which has come to light strongly suggests that the BMA, at its annual meeting on July 18, will dispense with it.

Such a decision would represent a profound change in outlook, seen from the medical man's standpoint, and would seem to have everything to recommend it. While there is no prospect whatsoever that the ordinary medical practitioner will now develop as an innovator and patentee—the BMA recommendations in any case are still opposed to private patenting—the chances of a new therapeutic substance achieving the large commercial production its usefulness may require would be greatly improved.

The report on which the BMA Council is being invited to make an end of the "no patenting" rule supplies some remarkable reminders of the anomalies which have flourished under the existing system and clearly indicates the changes that have occurred in recent years in the means by which advances are made in the therapeutic field. It recalls, for example, that patentable advances now are made not by clinicians but by research workers, who in most cases are not qualified medical practitioners. Chemists, physicists and engineers are also recognised to be very large contributors in the

On Other Pages

Leader:

Safeguarding Medical Invention . . 873

Notes and Comments:

Chemical Engineering Research . . 875
DSIR Policy . . 875
Science and Diplomacy . . 875
Neglected Energy? . . 876
The Phosgene Risk . . 876
Atomic Energy Developments . . 877
Basic Chemicals in March . . 878
NHS and Pharmaceutical Sales . . 878
Pioneers of Chemical Industry . . 879
Third Safety Conference . . 882
Structure of Proteins . . 882
Linseed Oil Allocations Ended . . 882
Contributions of a Leather Chemist . 883
Wax and Tannin from Waste Bark . 884
Higher Fertiliser Prices . . 885
Clarifying Agents . . 886
Advanced Rubber Research . . 887
Ceylon's New Rubber Policy . . 888
Applications of Vinyl Butyral Resins . 889
Synthetic Methionine . . 890
French Microscope Design . . 891
Standard Steels . . 891
New Electrode for Alkaline Solutions . 891
Standardised Safety Gloves . . 892

OVERSEAS CHEMISTRY AND INDUSTRY

New Trends at the Mellon Institute . 893
Mellon Principles in India . . 893
Fire Retarding Coatings . . 894
Spain's Pharmaceuticals . . 894
British and German Chemists Confer . 895
Brazil's Purchasing Programme . . 896

Fatal Fire at Tar Distillers . . 898
Birthday Honours . . 899

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production of a new material and the ethic which formerly was acceptable to doctors cannot be appropriately urged on them. There has also been a considerable change in the general type of new medical products, many of which are chemotherapeutic substances produced by large industries. The naturally occurring materials and their derivatives with which the doctors and apothecaries of old were mainly concerned no longer figure in the field of innovation, and biological and chemical substances cannot to-day be sharply distinguished.

These are a few of the many persuasive arguments by which the BMA will be urged to declare "that there is no longer any objection to the patenting of inventions for which members of the medical profession are responsible, provided such patents are assigned to the National Research Development Corporation with a view to their administration in the best interests of the public as a whole". The NRDC can, of course, offer suitable payment for inventions assigned to it. Thus agreement may be reached between the irreconcilables which in the past precluded a medical man from benefiting by the outcome of his observation and enterprise—the ethic that the results of medical research should be dedicated for the benefit of humanity, while patent law and practice permitted a temporary and conditional monopoly. If the representative body of the BMA accepts the proposals now being recommended to it the repugnant possibility of selfish exploitation of some essential new clinical material will no longer be a serious problem, and medical invention may have the help of the development fund of the NRDC.

These are the aspects of principal interest to medical men. There is in addition a further recommendation for action by the BMA, one which has long been obvious to chemists and others. So long as the "no patenting" rule is maintained no ownership, even on a national basis, can be exercised over the basic discovery of the medical scientist. The BMA Council has cited several examples of the injustices which can occur in those conditions, the predominant instance being penicillin. Because there was no "central patentee" of penicillin the British consumer has today to contribute royalties to American firms for penicillin made in this country.

Notes and Comments

Chemical Engineering Research

MORE than three years have passed since the Mechanical Engineering Research Organisation was formed under the *ægis* of the Department of Scientific and Industrial Research to fill a conspicuous gap in the national organisation of research. MERO's programme is of vital interest to every mechanical and chemical engineer and to countless industries. Yet no information about that organisation's activities has been released to the Press, beyond a very general statement regarding the establishment of new mechanical engineering laboratories at East Kilbride. Scraps of information which have since come—unofficially—to light show that an important chemical engineering element is planned as part of the East Kilbride programme. It is fairly certain that MERO has by now formulated its programme for the organisation of its research. But that is merely speculation. In the absence of any official statement it might be concluded that nothing has been achieved since the statement on East Kilbride was issued—more than a year ago—and that the reason for this exaggerated reticence was the absence of any progress to report.

DSIR Policy

IT is understandable that scientists should be reluctant to discuss specific investigations before finality has been achieved, although that policy, too, is sometimes carried to excess by withholding important news pending publication in a specific scientific journal—which is probably not seen by the majority of industrialists or engineers in the particular field. The deferment of publication of the objectives or results of Government research, the cost of which is borne by the public, is much harder to excuse. The public is entitled to know how the money is being spent and it is not apparent that anything can be gained by withholding general information regarding research programmes. Almost all organisations make a practice of supplying the Press with annual and progress reports and applied science is generally not prone to dispense with the aid of the Press in making its achievements known to industry. One of the functions of the DSIR organisations, which have generally been performed extraordinarily well in the past, is to make closer the liaison between the many research laboratories and industries. The chemical engineering industry, of which the research needs are outstanding, seems at the moment to have been excluded from this principle.

Science and Diplomacy

ELOQUENT of the deep respect in America for science and its practitioners and the confidence there in the capability of the latter to help shape current affairs is the scheme lately reported from Washington to establish a world-wide network of American scientist-diplomatists to help gather and give out research information. The suggestion was made by an influential U.S. Government committee headed by Dr. L. V. Berkner, a special consultant to the Secretary of State, after a review of the Hoover Commission's proposals for reorganising the conduct of United States foreign relations. The aim is to set up overseas science staffs in the principal American embassies—one such staff has, in fact, been working in London since 1947. Others are suggested for Johannesburg, Rio de Janeiro, Sydney (or Canberra), Paris, Rome, Berne, Stockholm, Ottawa and Tokyo. The scientists would rank as attachés with full diplomatic status. To be able to contemplate the supply of experts on so large a scale shows the great reserve of scientists on which America is able to draw. While our own scientific people could render at least as useful a service in the ambassadorial rôle, their numbers are barely sufficient to meet the pressing need to increase teaching and research staffs, while the current requirement of more scientific liaison officers for service throughout the Commonwealth is not yet satisfied. The last is one of the topics which the Parliamentary and Scientific Committee is to study at its meeting on Monday next.

Neglected Energy?

IF any good can come out of the fresh burden of tax on hydrocarbon oils—other than to the Treasury—the most hopeful prospect may well be the powerful incentive there is now to improvise to replace the costly materials in the fields of solvents and fuel. Supplementation and substitution were among the themes dealt with by Dr. Roxbee Cox, speaking recently in London to the Institute of Metals on the special problems of operating the gas turbine on the various possible "substitute" energy raisers, natural and blast furnace gases and the products of underground coal gasification. He may have reminded many—although he did not call attention to it—of the possible fuel yields in gas of high calorific value obtainable from sewage sludge. The practicability of that is vouched for by the fact that at least 40 German towns before the war were making profitable use of that unconventional fuel. The only English parallel which comes readily to mind is the Surrey sewage authority which was recently operating its motor transport on fuel from the same source. The system as practised in Germany had the great merit of comparative simplicity, the collection of sludge in "ageing chambers" requiring heat only if rapid fermentation and correspondingly quicker yields of gas, 75 per cent of which was methane of high calorific value, was required. The inoffensive waste of that process was not deprived of its value as fertiliser. The continued "dumping" of ordinary sewage sludge, in this country at least, seems like a form of fuel improvidence to which some attention could profitably be given at the forthcoming World Power Conference.

The Phosgene Risk

THE fact that phosgene may develop when carbon tetrachloride is used as a fire extinguisher is a scientific fact which a number of alarming occurrences have fully confirmed. That knowledge alone is, however, no adequate safeguard, as a recent laboratory fire in Manchester confirmed. Aluminium powder and magnetic iron oxide in an open container were being raised to a high temperature in an electric laboratory oven when the mixture fired and started to burn with approximately the intensity of the thermite reaction. On application of the CCl_4 extinguishers, the characteristic smell of phosgene was detected and nine persons were sufficiently affected to require hospital treatment. In the intense heat developed by the burning mixture (approximately 2000° C.) it is possible that the CCl_4 reacted with the atmosphere to produce a small quantity of $COCl_2$. A possible reaction is: $CCl_4 + H_2O = COCl_2 + 2HCl$. As a result of the fire the refinery concerned (Manchester Oil Refinery, Ltd.) has withdrawn all the CCl_4 extinguishers from its plant, replacing them by CO_2 extinguishers, either the small hand instruments type or the larger mobile type. Foam extinguishers were already part of the equipment, but additional 2-gallon foam extinguishers and 18-gallon foam engines have been installed. It is a welcome recognition of the continued seriousness of accidental ignition risks that the study of fire hazards will be given prominence in the discussions at this year's chemical safety works conference at Scarborough in September. Dr. J. B. Firth, of the North-Western Forensic Science Laboratory will deliver a paper on investigations of the cause of a fire.

Better Coal Output

Britain's deep-mined coal production in the week ending June 10 amounted to 4,010,400 tons. This compared with an average of 3,981,600 tons for the first 23 weeks of the year. The lower output of the previous week, 3,089,800 tons, was accounted for by the Whitsun holidays.

ATOMIC ENERGY DEVELOPMENTS

Harwell's Increasing Contributions to Nuclear Physics

THE increasing influence and activities of the Atomic Energy Research Establishment at Harwell are reflected in its organisation of an international nuclear physics conference to be held at Oxford from September 7-13.

The main sessions will be held in the lecture theatres of the Clarendon Laboratory, delegates being limited to about 200, and attendance will be by invitation only. Representatives are expected from the U.S.A., the British Commonwealth, Western Europe, and British universities working in this field.

The conference will be divided into two parts, the first concerned primarily with the use of high energy particle accelerators, for nuclear physics experiments, and the second with lower energy nuclear physics, including the use of atomic piles for experimental work.

Conference Discussions

Subjects to be discussed on September 7 and 8 will be high energy accelerators, experimental and theoretical high energy physics and beta-ray spectroscopy. On September 11 and 12 nuclear physics will be the subject and on the closing day, September 13, pile physics and neutron spectroscopy will be discussed.

The programme includes a visit to the Atomic Energy Research Establishment on Saturday, September 9.

Among the recent developments at the AERE, Harwell, is the completion of a second electromagnetic isotope separation plant, and the collection of separated or enriched isotopes has begun.

A Press note from the Ministry of Supply notes that a small electromagnetic separator has been running at Harwell for two years and has been supplying samples of isotopes of light elements for nuclear physics work.

The new plant, which is capable of separating for experimental work gram quantities of the isotopes of the heavy elements, including uranium, at a high degree of enrichment, was designed by a group of scientists at Harwell and manufactured by Metropolitan-Vickers Electrical Co., Ltd., in conjunction with the General Electric Co., Ltd., and British Thomson-Houston, Ltd. The first separations were carried out in May.

While the large e.m. plant is expected to be fully occupied on work for the establishment for some time to come, milligram samples of the lighter elements made by the smaller plant will be made available for export, as well as for use in Britain.

Radioisotopes produced in atomic piles have by now become quite familiar. In addition most naturally occurring elements consist of a mixture of isotopes (that is, atoms of different weight but chemically identical) although few of these naturally occurring isotopes are radioactive. Their separation is difficult because it depends on small differences in physical characteristics between the isotopes.

Several methods of separation can be used, for example, diffusion, fractional distillation and the electromagnetic plant. Most methods only increase slightly the concentration of the isotopes in a single operation and the process has to be repeated in many stages to get a high enrichment.

The advantage of the electromagnetic method is that, although only small quantities are produced, a high enrichment can be obtained from a single stage.

The electromagnetic separator works in this way. A beam of ionised atoms is projected into a magnetic field. The magnetic field causes the atoms to travel in a circular path. The diameter of the path depends on the weight of the atoms so that the heavier ones travel in a wider diameter circle than the lighter ones and can be collected separately.

Sharing Atomic Development

PROFESSOR Niels Bohr, Danish physicist and Nobel prize-winner, who was engaged in atomic research in Britain and the U.S.A. during the war, last week addressed an open letter to the United Nations. In this letter, which was shown to Danish and foreign Press representatives, the professor appealed for open dissemination of information on atomic energy as a means of relaxing international tension.

Dr. Charles Allen Thomas, vice-president of the Monsanto Chemical Company, is reported to have made the proposal that industry in the U.S.A. should be allowed to build and manage its own atomic power plant with Government-leased uranium. The doctor suggests the building of a $35 million power plant of 75,000 kW in the mountains of Idaho which are rich in phosphates but scarce in power.

BASIC CHEMICAL TOTALS IN MARCH

Larger Consumption, Production and Stocks

MARCH levels of production in basic chemicals and non-ferrous metals were generally higher than in the same month of last year. Although consumption was greater in most cases, stocks also improved. Exceptions were molasses, industrial alcohol and sulphur, stocks of which were reduced.

Estimated numbers employed in the chemical and allied trades for March (in thousands) were 443.7, being 11.7 more than the corresponding period of 1949, and 1.7 fewer than February this year. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 256.5 (188.5 men, 68.0 women); paints and varnishes 38.1 (27.1 men, 11.0 women); oils, greases, glue, etc., 67.2 (53.9 men, 13.3 women); pharmaceuticals, toilet preparations, etc., 81.9 (42.6 men, 39.3 women).

These figures and the table below are abstracted from the *Monthly Digest of Statistics*, No. 53 (HMSO, 2s. 6d.).

	March, 1950 Thousand Tons			March ,1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	162.7	168.0	—	144.9	156.0	—
Sulphur	—	31.3	66.0	—	26.0	69.9
Pyrites	—	19.6	75.0	—	20.8	74.0
Spent oxide	—	17.9	182.4	—	16.3	168.9
Molasses (cane and beet)	9.0	41.1*	227.6	9.5	20.9*	265.8
Industrial alcohol (mil. bulk gal.) ...	2.69	2.75	0.61	1.44	2.12	5.6
Ammonia	—	7.15	5.58	—	7.08	5.21
Superphosphate	21.3	36.1	—	22.2	37.2	—
Compound fertiliser	221.3	353.0	—	186.8	288.3	—
Liming materials	—	460.4	—	—	466.1	—
Nitrogen content of nitrogenous fertilisers	23.59	31.78	—	21.77	24.47	—
Phosphate rock	—	96.2	212.6	—	99.8	147.0
Virgin aluminium	2.66	14.6	—	2.78	16.1	—
Virgin copper	—	32.0	115.9	—	34.2	99.4
Virgin zinc	7.10	21.7	45.1	6.26	19.6	41.6
Refined lead	8.16	13.2	64.6	5.82	12.8	26.4
Tin	—	2.82	—	1.28	2.46	21.0
Zinc concentrates	—	15.0	64.0	—	14.5	30.5
Magnesium	0.28	0.28	—	0.29	0.23	—
Pig iron	187.0†	146.0†	499.0	179.0†	140.0†	246.0
Steel ingots and castings (including alloys)	330.0†	—	1,280.0	318.0†	—	1,031.0
Rubber: Reclaimed	0.62	0.61	2.39	0.44	0.48	4.0
Natural (including latex)...	—	4.72	42.9	—	4.28	47.5
Synthetic	—	0.06	0.93	—	0.05	1.87

* Distilling only. † Average of five weeks.

NHS Stimulates Pharmaceutical Sales

THE influence of the operation of the National Health Service on the demand for pharmaceutical products in the domestic field, which continued to increase, was referred to in the report for 1949 of the director of The British Drug Houses, Ltd. The overall margin of profit on that side of the company's business was stated to be narrow, but the turnover represented a large percentage of the total trading. Any substantial change in Government policy could result in serious consequences for the company and for the industry as a whole.

Whatever economies in the National Health Service might be instituted, they could hardly be at the expense of the use and development of therapeutic agents that were the outcome of scientific research. Those were essential in the treatment of disease and, in addition, were an important factor in the country's export drive. It was this type of product that the company's pharmaceutical business was mainly concerned.

The company records that during the year under review it introduced, *inter alia*, a new product, Anacobin, the first preparation of pure vitamin B_{12} to be issued by a British manufacturer. In the laboratory and fine chemical field, new processes had been worked out which had led to the production of substantial quantities of certain fine chemicals for industrial use that were formerly so expensive as to be regarded as laboratory reagents only.

PIONEERS OF CHEMICAL INDUSTRY

Achievements of a Century Recalled at Widnes

THE contribution made by chemical industries to the growth and well being of communities was exemplified last week on Merseyside when the town of Widnes commemorated its centenary as a centre of chemical production.

One hundred years ago, Widnes and the neighbouring villages had a population of 2000. To-day it is a communty of 45,000 owing its importance very largely to the fact that it has become the thriving centre of a chemical industry which was established by a handful of far-sighted industrialists. That work now employs 5000, about one-third of the town's working population.

The personalities and events which helped to shape Widnes' present important character have been interestingly recalled in a short history produced by I.C.I., Ltd., of which the local General Chemicals Division were hosts on June 9 at a commemorative luncheon to people prominent in Widnes and in local and neighbouring chemical industries.

That theme was presented in fuller detail and perspective by Sir Frederick Bain, M.C., deputy chairman of I.C.I., Ltd., when he proposed the toast of "The Town and Industry of Widnes " at the luncheon. The response was given by the Mayor (Councillor John Ludden).

The First Works

The I.C.I. note claims that the first chemical works in Widnes—two—were built in 1847. One, making borax and later soda, was started by a Glasgow man, John McLellan. The other, and more important, was founded by John Hutchinson (then only 25 years of age) and his partner Oswald Earle. Hutchinson's No. 1 works, as it was later called, was the first in Widnes to use the Leblanc process for the manufacture of alkali, a fact which has only recently come to light. It had long been a mistaken tradition in the town that James Muspratt, whose son had an alkali works at Woodend, founded the local Leblanc industry. In fact his works were not built until 1852.

In 1850 a third pioneer entered the field, William Gossage, who erected a small soda works on the other side of the Widnes-St. Helens Canal.

Sir Frederick Bain

By 1850, Hutchinson was employing about 100 men in No. 1 works, Gossage was operating in a small way, and McLellan was making borax at his North British Chemical Works. It is reasonable, therefore, to date the beginnings of the Widnes chemical industry from this year, although strictly it might be taken as beginning in the summer of 1847, when Hutchinson's No. 1 works were erected.

Another important works was started in 1858, when Hutchinson's works manager, Henry Deacon, broke away and formed a partnership with William Pilkington. Deacon wanted to exploit the ammonia-soda process instead of the Leblanc, and quarrelled with his partner.

Deacon then entered into partnership with Holbrook Gaskell, who insisted on using the conventional Leblanc system. The present Gaskell-Marsh group of works of I.C.I. General Chemicals Division stands on the site of Deacon's original factory.

Hutchinson and the other soda manufacturers improved and elaborated the original Leblanc process, and it became the basis of the heavy chemical industry. Twenty years after Hutchinson built his factory, the population of Widnes had risen to 14,000; within another 20 years this figure had been doubled. Salt from Cheshire, pyrites from Ireland and Spain, and limestone from Derbyshire, Cornwall and Wales poured into the Widnes factories to be transformed into chemicals. The picturesque signs with which the Widnes chemical manufacturers labelled their casks and carboys—the bull, the kangaroo, the thistle and the skull and crossbones—all became familiar sights in the industries of this country, on the Continent and in America.

But Widnes was not only manufacturing chemicals. In 1891, the United Alkali Company, a firm which by that date embraced most of the chemical manufacturers in Widnes, set up in the town the first industrial research laboratory in Britain. Men such as Deacon, Gossage, Hargreaves and Hunter established a tradition of industrial investigation, and from their research came new processes, some still used to-day, for manufacturing soda, chlorine and caustic soda.

The Widnes research laboratory, now the main laboratory of the General Chemicals Division of I.C.I., has many notable achievements to its credit, and for over 50 years it has been the hub of the local heavy chemical industry.

Chlorine Products

It assisted in the change-over from the Leblanc soda processes to the modern production of chlorine by the electrolysis of salt—a revolution in chemical manufacture —and in the development of the many organic and other products now derived from chlorine.

The laboratory played a vital part during the second world war. It took a large share in research connected with all forms of chemical defence and developed and operated processes by which the nation was kept supplied with many key chemicals. It is public knowledge that part of the Widnes staff was intimately engaged in atomic research during the war. Widnes made outstanding contributions to the production of uranium metal and of uranium hexafluoride, and helped to lay the foundation of the analytical chemistry of uranium.

Here also, during the war, the vinyl chloride process was developed to provide a substitute for rubber. At the same time work was going forward on two of the greatest chemical developments—Gammexane and Methoxone. Both are manufactured on a large scale in Widnes to-day.

More recently the laboratory has worked on the fluoro-chloromethanes, previously imported under the name of Freons; which have produced radical alterations in methods of refrigeration, and are now being produced on Merseyside under the British name of Arctons. Yet another postwar product of the Widnes Laboratory is the unique plastic, polytetrafluoroethylene. The laboratory is producing this, as Fluon, on a semi-commercial scale.

The personalities of the early leaders in chemical production in Widnes and the times in which they lived were vividly recalled by Sir Frederick Bain. He welcomed the guests on behalf of the General Chemicals Division of I.C.I. and expressed the regrets and apologies of the chairman, Lord McGowan, for his absence.

In the course of his speech, Sir Frederick Bain said:—

It sometimes seems that this present time is one of the most disturbing and dangerous periods through which the world has passed. But I dare say that those who lived around the turn of 1850 and were alive to affairs thought pretty much in the same terms as we do to-day.

In 1847 Russia absorbed Poland; there was war in Switzerland. In 1848 there were revolutions in Paris, Berlin, Vienna, Sicily. Austria was at war with Sardinia. Prussia invaded Denmark, the Pope was forced to flee from Rome and in this country the Habeas Corpus Act was suspended. We were fighting the Sikhs at Chillianwallah and Gugerat. In 1850 the British blockaded the Piraeus to avenge an assault on a British subject, whose name, strangely enough, was Don Pacifica. The writ of Britain ran far in those days. But let us remember that those same years saw the burgeoning of genius in Tennyson, the Brontes, Dickens and Thackeray.

A Toronto paper, *The Examiner*, printed exactly a hundred years ago a passage which is an admirable illustration of the truth of the old French saying that "the more things change the more they remain the same." "Russia, the empire which subsists on the most rude and naked basis of main force is the great depository of warlike menaces; and the advance of her encroachment has now reached such a point that the next step seems certain to involve Europe in a war of resistance. . . ."

Benefits of Industrialisation

We live in an age when it is claimed that events have become so huge and complex that men no longer have the individual significance they had in former days. This is a view of our contemporary situation that I reject utterly. By no means let us forget that the early history of industrialism had its wrongs, its shocking wrongs of child labour, filth and preventable disease. But let us not forget, also, that these wrongs were remedied, while the benefits of industrialisation remained, and are with us now.

It was glass that brought light into human homes; plumbing, soap and chlorine, health and length of days; the textile industries, and a host of others, that brought beauty and dignity. The chemical factories may have appeared satanic enough—certainly they were no garden of roses—but the men who established and developed them bear no whit of resemblance to the grasping ogres of the conventional picture of industrialists in the past. They lived and toiled on the scene of their enterprises; the contributions they made in leadership and inventiveness were personal ones, they were the visible captains in the field of battle.

Of the date of Hutchinson's arrival in Widnes there is no doubt. He established his No. 1 works at the mouth of what is still called the " New Cut " in the summer of 1847. In the course of a year or so he was employing more than a hundred men there in the manufacture of soda by the Leblanc process; the chemical industry history of Widnes had begun. John Hutchinson was a remarkable personality. With no inherited wealth, with not more than a matter of a few months experience in the manufacture of alkali, at the age of 25 he was owner and manager of his own factory. One might ask where is the young man today who would embark on such an enterprise? Have times so changed or are our young men less adventurous?

Hutchinson's first and prudent object was to have somewhere to dump the rapidly accumulating waste from his factory; this waste, he foresaw, would become an increasing embarrassment to himself and to future alkali-makers in the area. But the plan for which Hutchinson deserves most credit for conceiving was that of cutting a dock and laying down a system of private railways to serve the future industries which he, quite rightly, expected would develop in the town. John Hutchinson, more than 90 years ago, planned one of the first " industrial estates " in the country. After his death in 1865, it was round his dock and on his shrewdly acquired land that the second great development of Widnes chemical industry took place. His foresight was amply justified by events.

Great Leaders

Sir Frederick Bain went on to refer to other great leaders of Widnes chemical industry. William Gossage, who went to the town in 1850, established there a world-famous soap industry. Henry Deacon, he recalled, went to Widnes as John Hutchinson's first works manager, and eventually devised, with Dr. Ferdinand Harter, the process for the manufacture of chlorine, which practically held the field until the second decade of the present century. James Muspratt, in 1823, was the beginner of a long family connection with the Widnes chemical industry, being eventually succeeded by his sons Frederic and Edmund Knowles Muspratt. The last named's son, Sir Max, in later years became chairman of the United Alkali Company.

From 1847, for almost 20 years, McLellan, Hutchinson, Gossage, Muspratt, Gaskell and Deacon were the only names in the Widnes chemical industry. Their enterprise built up the tradition of this industry in the area, and, during the great commercial spurt of the 70's other industrialists made Widnes the site of their undertakings. Today Widnes is still proving a magnet for new chemical developments. Ludwig Mond, writing to his parents in 1872, said of Widnes, as he knew it, that " There is nowhere in the world where a factory could be set up with such ease and small capital, and where such working power can be found. . . . "

The Alkali Industry

In these cautious days it seems almost absurd that a youngster with a few months' experience of industry and with a half-conceived process in his pocket—along with a handful of paternal florins—should seek to storm the gates of the British alkali industry, and—more amazing still—that he should succeed. For ten years Mond made Widnes his headquarters; it was here that he established his home and it was in Widnes that Alfred Mond, the first Lord Melchett, was born. It was here that Ludwig developed his sulphur recovery process—the first solution of the problem that was finally to be solved by Chance of Oldbury. But let us not forget that it was John Hutchinson who had the insight to realise that Ludwig Mond, the enthusiastic young man from the Continent had a worth-while idea and the ability to carry it to fruition.

But there have been giants nearer to our own time to whom credit must be given. Sir Max Muspratt, Sir Christopher Clayton, John A. E. Rayner and Sir Holbrook Gaskell, are names honoured and respected in Widnes today, and I wish to pay tribute to those who, still in active service, have given, and are continuing to give, of their best on behalf of our industry in this town. We salute the thousands of devoted people who have made the working population of Widnes.

In the chemical industry there is no resting on established process and routine, and the hereditary skill of the Widnes chemical worker will ensure the continuing development of the industry in this town.

THIRD SAFETY CONFERENCE

Varied Scarborough Programme

SAFETY in chemical works will again be the subject of a conference to be held at Scarborough. The discussions, organised by the Association of British Chemical Manufacturers and the Royal Society for the Prevention of Accidents, will take place from Friday, September 29, to Sunday, October 1, under the chairmanship of Mr. J. Davidson Pratt, director, ABCM.

Proceedings will begin on Friday evening with a short introductory address by Prof. D. M. Newitt, president of the Institution of Chemical Engineers, who will be followed by Mr. J. Eyers (Vulcan Boiler & General Insurance Co., Ltd.), with a paper on "Safety in the Services Department."

Speakers on Saturday morning will be Mr. M. E. E. Chanter (Shell Refining and Marketing Co., Ltd.) "Fire Hazards and Precautions in the Petroleum Industry"; Mr. J. Howlett (The Distillers Co., Ltd.): "Fire Hazards and Precautions in the Manufacture and Use of Solvents"; and Dr. J. B. Firth (North Western Forensic Science Laboratory): "Investigation of the Causes of Fire." The evening will be devoted to a Brains Trust, with Mr. H. R. Payne (I.C.I., Ltd.), as quiz master.

The final session on Sunday morning will deal with fusion welded pressure vessels. Mr. W. E. Chipperfield (Babcock & Wilcox, Ltd.), will express the manufacturers' point of view and Mr. J. W. Strawson (Shell Refining and Marketing Co., Ltd.) will speak from the point of view of the user.

Linseed Oil Allocations Ended

AS a result of the improvement of supplies, the present allocation scheme for linseed oil will be discontinued from July 2. From that date supplies of raw oil will be made available to processers and other direct buyers. Manufacturers requiring supplies of processed oil should place their orders direct with a processer in the ordinary way of business. No permit will be needed to buy processed oil.

Applications should be made to the Ministry of Food, Oils and Fats Division at least one week before the end of each month (beginning with June) for the quantities of raw oil required during the following month, by processers and other direct buyers, including oil to be shipped with paste paint. The proportion of oil which may be shipped with paste paint will continue at the present rate of one part of oil to two parts by weight of paste paint.

STRUCTURE OF PROTEINS

Tests by X-Ray Crystal Analysis

ONE of the greatest unsolved problems in the borderland of biology, chemistry and physics is the structure of proteins. It was only during the last 40 years that it had come to be realised that proteins were built up of particles possessing individuality and were really giant molecules, according to Dr. John Iball in his lecture on "Some Physical Properties of Proteins" delivered to the Royal Society in Edinburgh last week.

The main advances made during the last few decades had been as a result of the application of physical and physical-chemical methods.

Proteins, he said, possessed astonishing variety but it was originally considered that they could be roughly divided into two classes, according to their distribution in the organism and their physical character. The application of X-ray crystal analysis had revealed more and more of their structural characteristics and it was now seen that these two classes were probably different manifestations of some more fundamental structural pattern.

One of the most remarkable properties of proteins was revealed in the fact that, to give only one example, hæmoglobin from one species of animal was quite distinct from that from another species and yet there were often no conspicuous chemical differences.

These differences from species to species which formed the basis of blood groups and immunisation could be shown to persist when we changed the form of a protein molecule from a compact globular shape to a thin flat film only a few atoms thick.

"Egg" Albumin from Fish

ANOTHER process for the production of albumin from fish (THE CHEMICAL AGE, 62, 528) is reported from Norway, where scientists claim that they are now producing it on a commercial scale in a form equivalent to white of egg. Trial production, by what is stated to be a completely chemical-mechanical process, now reaches 600 lb. of dried "egg white" a day. A weight of 10-12 lb. of fish waste is required to produce 1 lb. of the finished article, which is usable for the making of ice cream, puddings, soup powder, etc. The product intended for human consumption will be priced at 5s. to 7s. per lb., but the commercial product will be less refined and correspondingly cheaper.

CONTRIBUTIONS OF A LEATHER CHEMIST

Recollections of Advances in Process Developments

TYPICAL examples of the service being rendered by chemists to facilitate and improve the processes of leather manufacture have been described by Mr. R. Faraday Innes, speaking in London on June 9 to the Society of Leather Trades Chemists.

Recalling his 48 years in chemistry, on the eve of his retirement, Mr. Innes made clear that modern leather processes owe a large debt to the chemist's substitution of certain materials in tannage and particularly the study of water treatment.

Mr. Innes recalled that during the early stages of his service in Northampton, with the British Chrome Tanning Company and others, greasy backs were a great nuisance, and up to 30 per cent of the skins had to be degreased before seasoning and glazing was possible.

This in time was traced to the use of D/S skins in which staling had produced free fatty acid. It was not due so much to a high fat content, which was seldom more than 5 per cent, on the dry weight, but to the free fatty acid which was converted to lime soap and then to chrome soap in the process work. The chrome soap had high absorptive powers for neatsfoot oil, which was taken up preferentially in the affected areas.

Source of Leather Defects

Mr. Innes advocated a full pickling followed by treatment with white spirit, and although goatskin tanners said that the job was not worth it, he believed that improvements in the levelness and brightness of dye and finish, and the consequent upgrading of the product, would more than compensate for the cost. He maintained that many minor troubles due to this cause could be ascribed to greasiness.

The hardness of the water at Northampton (60 parts per 100,000) caused much trouble, but two 10,000 gallon tanks were installed in which the water gas softened by the addition of the calculated amount of lime and soda, followed by plunging and settling. This reduced the hardness to 5 parts per 100,000. Previously the Lancashire boilers had to be scaled three or four times a year when two men would work for four days chipping off the ⅜ in. layer of scale with hammer and chisel. Afterwards even old scale would gradually soften and fall. Such scale could increase fuel consumption by about 50 per cent, which would mean considerable expense on a use of 1,000 tons a year.

Other troubles, however, followed from the use of this water. Investigations showed that the reaction between the permanent hardness salts and the chemicals was very slow, but that less alkali need be used if the water were first heated and then allowed to stand. The alkalinity of the water, in the region of pH 10 or more, was too high to allow the enzymes to work, though it allowed the pelts to get blown grain. The difficulty was avoided by using separate water reduced to about 10 degrees of hardness without the use of soda.

Differing Results

Mr. Innes gave an instance of leather from similar raw materials produced respectively in Northampton and Worcester, where the latter product was softer and fuller than the former, which, though good, was much firmer. Microscopically, the first showed much greater separation or differentiation of the fibres into fibrils.

The Northampton water came from a well under the cattle market and, although containing 2 parts per 100,000 of ammonia as well as nitrates and nitrites (signs of heavy sewage contamination) had less than 1000 bacteria per c.c. when drawn, and that proportion was reduced on keeping.

Severn water, however, contained only the ordinary salts, but had a bacterial count of 100,000 per c.c. which rose enormously on standing. There were many liquifying and fluorescent bacteria. When tested by enzymatic digestion of gelatin by Wood's method, the Northampton water was found to be free of tryptic enzymes, of which the Severn water contained a considerable amount.

In conjunction with chemical analyses it did seem that the bacterial flora and not the salt content was the important point.

A surprising result followed the sinking of a well 178 ft. deep at Northampton, as the water delivered at 58° F. all the year round had a total hardness of only 1 part per 100,000, and was in fact a natural zeolite water equivalent to N/100 sodium bicarbonate solution.

The rotting of leather and the means of protection against it had often been discussed before, but the latest work rounded off the story. Red rot occurred when vegetable leather contained 5-7 per cent

(continued at foot of next page)

WAX AND TANNIN FROM WASTE BARK

Rapid Solvent Extraction in the U.S.A.

A THREE-YEAR investigation by the Oregon Forest Products Laboratory has provided evidence that wax and tannin can be produced from Douglas-fir bark. The bark, which hitherto had been used for fuel, or discarded, is available in large quantities from the pulp and paper, pole and piling and plywood industries. This research and some quantitative results are summarised in a current U.S. report (*Chemical Engineering News*, 28, *20*, 1656). Douglas-fir bark contains about 5-10 per cent of a hard, non-tacky wax, of which about two-thirds is soluble in petroleum derived solvents, and the remainder in benzene or the chlorinated aliphatic hydrocarbon-type solvents. Experiments showed that wax could be extracted from moist bark in about 3 hours, with nearly complete recovery of solvent.

The hexane-soluble wax fraction is light in colour, melts at 140°-145°F., and is composed of lignoceric acid, ferulic acid (4-hydroxy-3-methoxycinnamic acid) and lignoceryl alcohol largely combined in the form of esters.

The benzene soluble portion is brown in colour and of a more complex chemical nature. It also melts at 140°-145°F.

Douglas-fir tannin, suitable for leather manufacture, has been obtained in yields of 8 to 18 per cent, based on the dry weight of sound bark, and is present in the bark from young second-growth trees and the top bark from older trees.

Laboratory studies made in the past year have shown that tannin can be leached easily from the bark with hot water in wooden tanks, which are arranged to give a counter-current extraction operation. About 6.5 parts of water to 1 of moisture-free bark was required. Between 85 and 100 per cent of the tannin extracts were concentrated to 50 per cent total solids content in a vacuum evaporator and dried without loss of tannin by conversion to insolubles.

The extraction of wax and tannin can be combined advantageously into a single operation, but an adverse factor is that bark with the highest tannin content has the least amount of wax. For best results bark from both young and old trees should be used.

First results of extraction of wax give an output of about 120 lb. per ton of oven-dry bark. In addition, Douglas-fir bark has been found to contain from 5 to 8 per cent of dihydroquercetin which may be of use in medicine.

CONTRIBUTIONS OF A LEATHER CHEMIST

(*continued from previous page*)

by weight of sulphuric acid, which could accumulate in a few years in industrial atmospheres, though the conversion of atmospheric sulphur dioxide to sulphuric acid took place only in foggy conditions.

The conversion of atmospheric sulphur dioxide to sulphuric acid in the leather was due to the presence of small traces of iron in an ionised form. If leather spectroscopically free from iron was exposed to sulphur dioxide it did not rot. Air free from sulphur dioxide occurred only where wood and not coal was burned. When sulphur dioxide and the particular iron compounds were present, rotting would occur in about four years.

If, however, the iron was converted into an un-ionised form, there was no catalytic oxidation of the sulphur dioxide, and no rotting. The best salt for looking up the iron in un-ionised complexes was sodium pyrophosphate. Exhaustive gas chamber tests upheld this claim, so that the work started by Faraday at the Athenaeum in 1848 could be considered completed.

[Mr. Faraday Innes began his training in 1902 and served with the British Chrome Tanning Company in Northampton from 1912-1920. He has since been intimately associated, since 1921, with the research of the British Leather Trades Research Association].

Canadian Trade Fair

A FEATURE of the third Canadian International Trade Fair which closed in Toronto last week has been the success of British firms, especially the British Tool, Machine Tool and Scientific Instrument section which occupied 75 per cent of the floor space. Original exhibits in this section included a telescope fitted with an extra lens which when swung in front of the fixed crystal converted it into a microscope; a 19-centimetre high temperature powder camera capable of taking X-ray analysis up to 1000° C., and micrometers fitted with Braille markings for the use of blind workmen.

HIGHER FERTILISER PRICES

Possible Effects of the New Schedule

THE imminent sharp rise in prices of chemical fertilisers will be the first really substantial change in some 30 years. If the ups and downs of the war and post-war period in War I are ignored, the general increase of about 25 per cent, which comes into effect on July 1 represents in fact the first large rise for more than half a century. These changes are the result of the removal of subsidy, the first stage of which has been scheduled to take place on July 1 this year. For some months the industry and its consumers have been held in suspense, knowing that there would be seriously large changes on that date but not knowing how much de-subsidisation would take place on this date and how much would be left until the second and last stage, July 1, 1951.

It is not irrelevant to recall the history of the fertiliser subsidies. They began to accumulate early in the war. Farmers were asked to produce more food and maximum prices for crops were fixed; they were given a promise that fertiliser prices would be kept at their then current levels. Maximum control prices were therefore imposed.

Rises in such raw materials as phosphate rock, potash, sulphuric acid, were met by increasing subsidies; Government departments were in any case acting as both buyers and sellers of basic raw materials in many cases. Rises in labour, bagging, transport, and general factory costs were balanced by direct subsidy allowances to fertiliser manufacturers. At no time since approximately 1940 has a farmer paid the real cost price for a load of mineral fertilisers.

Controlled Selling Prices

Since the end of the war, these somewhat invisible subsidies have gone on steadily increasing, while the controlled selling prices of fertilisers have stayed practically unchanged. Now these economic buttresses, which have taken 10 years to reach their present size, are to be removed in two stages. The steep price rise this summer will be followed by another rise next summer.

In retrospect, it appears unfortunate that some proportion of the rising costs of fertiliser manufacture was not passed on, year by year, to the farmers. The original promise that fertiliser prices would not rise at all was equivalent to a blank cheque, an ill-conceived piece of assurance.

Fertilisers were exceptionally cheap from about 1922 to 1939. To freeze their prices at these levels during a decade of unprecedented agricultural expansion was certainly an example of " feather-bed " economics. The result is that now on July 1 the exchange of the feather-bed for a relatively hard pallet is going to be severely felt by many farmers, especially the smaller ones.

Psychologically there is another matter for regret. In the whole ten years of the subsidised period very few buyers of fertilisers have been aware that these commodities have been subsidised at all. Neither the Government nor the industry had, until recently, drawn much attention to this important fact. The consumer had had little chance to be fore-armed by knowledge of the facts.

Compound Fertilisers

Superphosphate will rise by £1 17s. 6d. per ton; sulphate of ammonia by £2 6s. 6d.; muriate of potash (60 per cent grade) by £2 10s. These fertilisers are, of course, the " Big Three." Not only are they considerably used separately but they are the dominant ingredients of compound fertilisers. Compound fertilisers will rise by about £3 per ton, though the actual rise permitted varies slightly with analysis. Broadly speaking, the price addition is one of 25 per cent.

What will be the effect upon fertiliser consumption? Clearly, if all farmers decided to spend no more per year upon fertilisers, there would be a drop in tonnage of 20 per cent; 10 tons at, say, £10 will cost the same as 8 tons at £12 10s. A fall in demand of some 20 per cent is the worst that can happen in the coming agricultural year.

A reduction on this scale is fortunately most unlikely. On most of our large arable farms fertilisers are indispensable for the maintenance of economic cropping levels; these farms could economise on fertiliser purchases only by reducing cropping acreage, not by reducing their rates of application per acre. It is only on the small mixed farms that proportionately large economies may be expected. On the other hand, cattle feedingstuffs have already been de-subsidised and the prices of these commodities have risen even more sharply.

Farmers whose main interest lies in producing milk or meat must turn increasingly

(*continued overleaf*)

Clarifying Agents

Observations by a New Wine Group

MUCH practical experience in the use of clarifying agents, notably casein and bentonite, in the preparation of wines has been condensed in the first publication, in Argentina, of the journal of the recently formed Wine Institute. This is a section of the agricultural science department of the National University of Cuyo.

Volume 1, No. 1 of *Anales del Instituto del Vino* contains articles on the use of casein in the clarification of white wines, by A. Maveroff (director of the institute); enzymes in the clarification of musts, by J. Testa and A. Maveroff; clarifying and stabilising action of bentonite in wines, by P. G. Garoglio and A. Maveroff.

Use of Casein

In the study of casein it is concluded that one advantage of its use for white wines is the absence of over-clarification. It must, however, be mixed immediately in the whole batch of wine because of rapid coagulation.

Sodium caseinate appears to give the best results in 0.5 per cent solution. The *p*H range in the tests was 2.7 to 5, and 4.7 appears to be about the best, but normal variations do not appear to have much effect.

The authors agree with earlier workers that the addition of tannin has little or no effect. Some attention has been devoted to its determination and dosage in wines. Temperature is less important when using casein than with other clarifiers, but a fairly low range, below 16°C. is preferable. Casein appears to be advantageous also in eliminating iron, or reducing the iron " break."

The observations on the use of bentonite as clarifying agent indicate that it has proved particularly effective in the removal of protein matter and some of the iron; but it is pointed out that the present tests were entirely in the laboratory: large-scale work may require some modification. Some conclusions however were definite and reliable.

The bentonites used were of native origin, from Cuyo, the general qualities of which have been described, and their preparation, either in the form of fine powder or as suspensions, aqueous, acid, or alkaline, or in wine or alcohol. It is preferably used as fine powder and vigourously stirred in.

Degree of Concentration

In aqueous suspensions the best concentration is 5 per cent, and for fine powder 0.5 to 1 g. per litre. A temperature range of 1° to 22°C. was used, but it was mainly in iron elimination that the lower temperatures proved advantageous. The temperature factor is not of fundamental importance, and much the same may be said of *p*H. No obvious advantage was gained with either acid or alkaline suspensions. The action of bentonite in iron elimination is not clear, but it is probable that oxide reduction is stimulated by the bentonite and the iron present is converted to phosphate and more readily precipitated.

HIGHER FERTILISER PRICES

(continued from previous page)

towards home-grown fodder, to cereals, lucerne, clovers, and particularly to grass. They cannot produce more of these crops without considerably increasing their use of fertilisers. Moreover, there is to be a new subsidy scheme to encourage the increased application of fertilisers to grassland; this will be paid directly to farmers in the form of a proportion of their costs for such applications.

Despite this abrupt price rise, the prospects of the fertiliser industry can still be considered to be good. A gradually rising consumption by grassland farmers will compensate any immediate decline in consumption on the small mixed farms and should in time build up to a very large total tonnage. On the large arable farms there will be little or no reduction in demand. The 1950/51 agricultural year may be one of adjustment and " standstill " so far as total consumption is concerned, but an appreciable drop in tonnage is most unlikely.

A more serious threat to the continued expansion of the fertiliser industry is represented by the further rises in raw material and manufacturing costs. To stabilise those at a reasonable level is more urgently necessary than to safeguard the current scale of consumption of the finished materials.

ADVANCED RUBBER RESEARCH

Wide Field of New Dunlop Centre

THE chemical research work undertaken at the newly opened Dunlop Research Centre includes fundamental studies as well as investigations directed towards improvement in manufacture and development of new processes and products. The wide field covered includes the chemistry not only of rubber and allied substances such as synthetic polymers and plastics, but also that of many other materials.

These include natural and synthetic textiles, surface-active agents, bactericides and fungicides, surface coating compositions, adhesives and many specific materials associated with the company's various manufactures.

Research chemistry of this type demands the most up-to-date equipment. This has been unstintingly provided in these new, very much enlarged laboratories. The staff has also been increased and facilities for these highly specialised studies thus considerably improved.

In the organic laboratories provision has been made for the fundamental study of high-polymers and their preparation by various polymerisation techniques. The polymers are evaluated in various ways including physico-chemical methods—by osmometry, viscosity, refractive index measurements and dilatometry. Much of the apparatus used in this work has been designed and constructed either in the laboratories or in collaboration with the research instrument section located in the building.

Other branches of rubber chemistry under investigation include such projects as chemical treatments for rubber surfaces, mastication and chemical plasticisation, vulcanisation and acceleration, reinforcement and reinforcing agents, oxidation and antioxidants, adhesion and bonding agents, and the chemistry of rubber latexes and derivatives. Such work is applied to both natural and synthetic materials.

The physico-chemical laboratories are well-equipped for fundamental research on such problems as surface activity, properties of the rubber particle in latex, preservation of latex and the mechanism of its coagulation.

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Intelligent distribution characterises the bench layout and design in the analytical section of the Dunlop Research Centre. Noteworthy features are the easily accessible sinks, taps and vacuum services; remote control of gas supply; conveniently situated electric points (remote from water supply) and the section for books and paper work at the end of each bench

Ceylon's New Rubber Policy

Research on Manufacturing and Seed Oil Extraction

DESPITE the fact that world rubber prices have more than doubled in the course of a few months, Ceylon's programme to intensify the fabrication of rubber goods, the extraction on a commercial scale of rubber seed oil and the local use of rubber are being actively developed. In the last two months the price of natural rubber, which averaged less than 1s. a lb. last year, has risen from 1s. 4d. a lb. to 2s. 3d. For a brief period in May it was even higher.

The aim of the Rubber Service Laboratory, established by the Ceylon Government at Katukurunda, is to do research work which will enable Ceylon to be self-sufficient as far as rubber goods are concerned. The experience gained and the methods evolved are to be made available without qualification to anybody in the island who will embark on projects that will use rubber as a base for manufacturing articles.

Assisting Manufacturers

The laboratory will, in fact, assist the trade in producing any article out of rubber, from shoe soles to highly specialised articles, including callendered and "rubber-proofed" articles. It will also evolve a grading scheme for rubber to replace the present out-moded non-technical terminology such as smoked sheet, crepe, etc.

Dr. Sunderalingam, rubber technologist in charge of the laboratory, states that the extraction of oil from rubber seed on a commercial scale will shortly begin. About 60,000 tons of rubber seed fell in a season of 60 days and went to waste, so the oil extraction will begin under the rubber trees themselves. There will be mobile sterilising units visiting rubber areas, installing themselves in rubber estates and sterilising collected seed in mobile ovens. Once that is done the seeds can be crushed and the oil extracted by any expeller. This oil cannot be used for cooking purposes as there will be about half per cent rubber in it, but it can be made edible if the solvent extraction process is adopted.

Rubber is soon to be used for surfacing the area round the laboratory and its approach roads. The process will involve the use of latex (not rubber powder) with bitumen.

The laboratory has highly technical machinery and various items of apparatus never before used in Ceylon in rubber production. Among these are a radio-form heater which heats products uniformly electronically, a resilience testing machine, and a very delicate colorimeter. There are hydraulic presses exerting 20 tons pressure with the operation of a hand lever.

New Canadian Source of Solvents

Building of an additional unit in Sarnia (Ontario) by the Dow Chemical Company of Canada is to begin at once. The $1 million plant will manufacture principally three non-flammable synthetic solvents, all of which have major roles in the dry cleaning industry and as metal degreasing solvents. Of considerable significance to the Canadian market is the fact that carbon tetra-chloride will be manufactured. This material has not hitherto been made in Canada. An important by-product of the plant will be hydrochloric acid.

ADVANCED RUBBER RESEARCH

(*continued from previous page*)

Other important investigations include the close study of the actual mechanisms of oxidation, cyclisation and plasticisation of rubber and of other processes previously mentioned. The kinetics of rubber reactions used in various manufacturing operations are also given special consideration. Miscellaneous problems include studies on synthetic plastics and resins and on lacquers and paints for use in conjunction with rubber and gutta percha.

Analytical research work is concerned with the determinations in rubber mixings, by new and improved methods, of sulphur, halogens, oxygen (directly), carbon black, plasticisers, accelerators, antioxidants, natural and synthetic rubbers, as well as many other auxiliary materials used in rubber manufacture. In this work, microchemical methods have an important place, and use is made of modern techniques such as column and paper chromatography, polarography, etc.

Separate laboratories provide scope for work with the infra-red spectrometer, Spekker photo-electric absorptiometer, ultra-violet spectrometer, and for radioactive isotope techniques.

APPLICATIONS OF VINYL BUTYRAL RESINS

Their Use as Coatings and Adhesives

From A CORRESPONDENT

VINYL butyral resins have been manufactured since 1936 and used almost exclusively for safety glass laminates. Only recently have solution grades of these resins become available in granular form for use in coatings and adhesives. Of particular importance is the development of the wash primer type of metal conditioner and wood knot sealer requiring the use of vinyl butyral resins.

Polyvinyl butyral coatings and adhesives possess a good shock resistance, excellent adhesion to glass, wood, metal, leather and most plastics, retention of colour on exposure to light and heat and outstanding toughness and flexibility. Unlike most thermoplastics, these co-polymers lend themselves to curing of cross-linking to give a surface coating that is solvent resistant, hard and possesses a higher softening point than the unmodified resin. In addition, the resistance of the coating to moisture absorption is increased and its tendency to cold flow lessened.

The degree of hardness obtained can be controlled by the selection of curing agents and by modifying the amount used. Both resinous and chemical agents can be employed, the most successful resin being phenol formaldehyde and the most effective chemicals formaldehyde and glyoxal. Vinyl butyral resins are compatible with urea and melamine resins and they can be plasticised with many commercial plasticisers, such as dibutyl sebacate. Common solvents for the resins include alcohols, Cellosolve compounds and esters.

A Stable Bond

One of the most important developments in the adhesive field is the widening use of vinyl butyral-phenolic cements for bonding rubber, cork, asbestos board, wood, glass or ceramic parts, cloth, paper or metals to plastics of the thermosetting type. After the bond has been cured, it is stable to at least 100°C. and will not be softened readily by the application of water or solvents.

In metal bonding the standard technique is quite simple. The metal parts to be bonded are first thoroughly cleaned and dried; usually solvent degreasing is advisable. Next the solvent solution of the resin is applied to the metal surfaces and allowed to dry by means of a low bake at a maximum temperature of 250°F. for five minutes. After the solvent has been completely removed, the surfaces are pressed together under light pressure and heated to temperatures varying from 275° F. to 400°F. for periods of from 15 minutes to a few seconds, depending on the heat applied.

Modified techniques are used for bonding wood to metal as high temperatures tend to limit adhesion and cause deterioration of the wood; usually air drying is preferred to stoving. For bonding plywood a good deal of attention is being given to the use of phenolic resin syrups modified with vinyl butyral resins, which have the property of increasing tensile strength and improving impact strength.

New Wash Primer Conditioner

Undoubtedly the most important application of vinyl butyral resins is for the new wash primer conditioner for metals. This primer is actually a complex resin-chromate-phosphate solution, which has excellent adhesion to clean metal surfaces and air-dries rapidly to leave a uniform protective film to which most paints and coating will adhere. The wash primer originally developed by the U.S. Union Carbide and Carbon Corporation consists of a two-container system composed of a base grind made up of vinyl butyral resin, an insoluble type chrome pigment and some of the solvent, and an acid diluent composed of phosphoric acid, water and the remainder of the solvent.

The great advantages of this treatment over the standard type of wash primer, involving the sandblasting of the metal surface and subsequent application of aqueous phosphoric acid, are that the new method can be successfully carried out at low temperatures, it ensures better adherence of paint film and enables the treated metal surfaces to be exposed to the weather prior to the application of an anti-corrosion primer.

Application of wash primer type of metal conditioners can be carried out by conventional methods on clean, grease-free metal surfaces, both ferrous and non-ferrous. It is, however, necessary to alter the formulation to suit the particular metal. All types of paints adhere well to the

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Determination of Synthetic Methionine

Increasing Therapeutic Importance of New Amino Acid

From A CORRESPONDENT

METHIONINE, γ-methylmercapto-α-aminobutyric acid, one of the essential sulphur containing amino acids, was discovered by Mueller in 1922 in casein hydrolysates (*Proc. Soc. Exptl. Biol. Med.*, 19, 161, 1922) and given the empirical formula $C_5H_{11}NO_2S$. Its synthesis was first carried out by Barger and Coyne (*Biochem. J.*, 22 1417, 1928) by means of a modified Stecker reaction using β-methylpropionaldehyde.

Several other investigators later synthesised methionine, using improved and modified techniques. The synthesis of DL-methionine containing excess of the stable isotopes S^{34} and C^{13} in the beta and gamma positions was first accomplished by Kilmer and du Vigneaud in 1944 (*J. Biol. Chem.*, 154, 247, 1944).

Synthetic DL-methionine as at present synthesised from such raw materials as acrolein, hydrogen cyanide and ammonia is a white substance crystallising from water in lustrous white hexagonal plates. It is soluble in water to the extent of 3.4 gm. in 100 gm. water at 25°C. and 17.6 gm. at 100°C. Methionine is very slightly soluble in methyl alcohol (0.1 gm. per 100 cc. at 25°C.) and sparingly soluble in ethyl alcohol and other solvents.

The melting point of this amino acid is in the range of 268-70°C. when inserted in an open capillary tube in a bath at 240°C. and the bath temperature raised at a uniform rate of 3°C. per minute.

Methionine is indispensable in the diets of certain animals and it has been definitely established that it is the precursor of cystine which may be considered a breakdown product of methionine. The complete absence of this amino acid from the diets of experimental animals caused loss of weight, loss of hair and eventual death. The indispensability of methionine to human beings has been well established by several investigators, notably Rose, Haines, Johnson, Madden, Block, Albanese, Holt, Brumback, Franston, Jane and Irby.

Research workers of the Dow Chemical Company in the U.S.A., which produces methionine, conclude that if the average human adult daily requires 60 gm. and 50 gm. (man or woman) of a protein such as casein for the maintenance of good health, then approximately 2 gm. of methionine is required. In deficiency disorders and metabolic dysfunctions, higher quantities of methionine may be necessary.

Medical Uses

Methionine is of importance in the treatment of hepatic diseases and remarkable success has been achieved when both choline and methionine were intravenously injected into a patient who had severe heptatorenal injury as a result of large doses of barbiturates (Barclay and Cooke, *Lancet*, 2, 458, 1945). Research work carried out by several investigators has recently shown the value of this sulphur containing amino acid on histologic changes in the livers of patients with cirrhosis (*J.A.M.A.*, 136, 934, 1948).

The determination of methionine can be carried out by chemical and microbiological methods, the former giving the most accurate results. One of the most reliable of the chemical methods was developed by MacCarthy and Sullivan (*J. Biol. Chem.*, 141, 871, 1941), who utilised the property of methionine forming a coloured compound with sodium nitro-prusside and developed a satisfactory, rapid colorimetric method. Other methods are available utilising colorimetric and gravimetric methods. Assay of amino acids by microbiological methods involves the use of certain groups of bacteria as test organisms, the results being obtained either by turbidmetric or titrimetric measurements.

APPLICATIONS OF VINYL BUTYRAL RESINS

(*continued from previous page*)

treated metal surface but some lacquers based on nitro-cellulose and vinyl resins present difficulties.

In the petroleum and chemical fields a good deal of interest is being taken in the use of these metal conditioners followed by application of vinyl chloride-acetate coatings for pipe lines, oil storage tanks and air conditioning equipment, particularly fans where the corrosion on the edge of the fan blades is very severe. Here the wash primer gives a tight, adherent bonding surface and the vinyl resin topcoating provides wear and abrasion resistance.

Another quite important use for vinyl butyral resins is for modifying phenolic resins to make durable finishes for wooden tanks and for use as a knot sealer for pine lumber.

STANDARD STEELS

Certified Spectrographic Samples

A NEW development in standard steels for analytical purposes and photometric standardisation (construction of graphs) is announced by the Bureau of Analysed Samples, Ltd., Middlesbrough.

A series of eight spectrographic standard steels has been prepared in the form of rods ½ in. by 6 in. long and in fine turnings.

The chemical analyses, tabulated in the ascending order as percentages of each constituent are as follows:—

Silicon	0.01	0.13	0.18	0.25	0.29	0.37	0.62	0.81
Manganese	0.02	0.17	0.36	0.53	0.79	1.11	1.21	1.42
Nickel	0.05	0.18	0.56	0.84	2.08	2.92	4.10	5.15
Chromium	0.04	0.20	0.35	0.53	0.96	1.72	2.34	3.07
Molybdenum	0.01	0.19	0.32	0.43	0.54	0.95	1.29	1.41
Vanadium	0.03	0.12	0.22	0.26	0.36	0.46	0.52	0.65
Copper	0.09	0.11	0.11	0.18	0.23	0.24	0.31	0.50

The analyses were undertaken by the Pig Iron and Low Alloy Steel Analyses Sub-Committee of the British Iron & Steel Research Association.

The spectrographic standards are supplied as a set of eight rods complete with provisional certificate.

The turnings for photometric standardisation and general chemical analyses are supplied in a series of eight bottles, each containing either 100, 50 or 25 grams in each.

New Alkaline Solutions Electrode

THE difficulty associated with the measurement of the *p*H of high alkaline solutions is reflected by the fact that the standard Muirhead *p*H electrodes, made of soda glass, can be used only up to *p*H 10. Above this value sodium ions in the solution contaminate the electrode, causing a semi-permanent reduction in sensitivity.

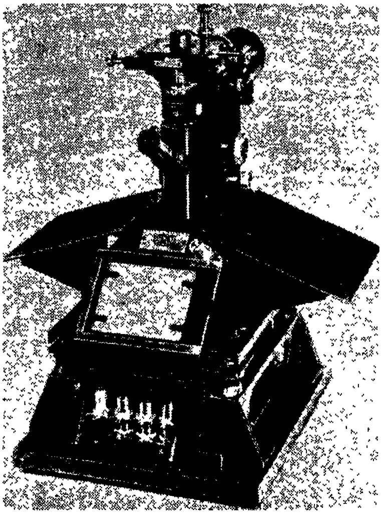
A new electrode, type D-340-B/3, made from lithium glass, almost sodium free, enables measurements to be carried out up to *p*H 13.5. It is fitted with a green bakelite cap to distinguish it from the standard type D-340-B.

Intended for measurement of values above *p*H 7, the electrode has an overall accuracy of 0.1 *p*H up to *p*H 12.5, and 0.2 *p*H from 12.5 to 13.5. Above *p*H 12 a correction for sodium ion concentration has to be applied, but does not exceed 0.3 *p*H.

A note from Muirhead & Co., Ltd., observes that lithium glass electrodes are sluggish and require time to give steady readings. Up to *p*H 12.5 the time taken is two minutes, and this increases to as much as 15 minutes above this value.

FRENCH MICROSCOPE DESIGN

New Instrument for Metallurgists



The housing of object glasses in the base of the instrument is among several examples of compact, intelligent design of this new French microscope

ONE of the exhibits at the 1950 exhibition organised by the French Society of Physics was a new type of metallurgical microscope, made by Microscopes Nachet de Paris.

Advantages claimed for this instrument, type T.M.67, are its compactness and ease of handling; instant 6 V 5 A light source; a double illuminator for easy changeover from prism to glass system by means of a lateral screw; projecting nose-piece which allows rapid change of eye-pieces, with consequent extensive range of magnification; and a shock absorber system to eliminate vibration and "foggy" negatives.

Incorporated into the optical system are achromatic object-glasses corrected for examination of samples without cover-glasses. These are slide-mounted for quick interchanges. The object-glasses and eye-pieces are designed for rapid and easy determination of the magnification.

Gift to University

A gift by the Firth-Brown companies, Sheffield, of £2000 a year for seven years to Sheffield University, coincides with the start of the university's £350,000 engineering department extension scheme.

Technical Publications

INCLUDED in the recent ABCM report on the British chemical industry was a chart setting out the principal products and the routes by which the raw materials are treated to form final products for other industries. For the benefit principally of students of universities and technical institutions the chart has been reprinted and is now available separately from the report (1s. post paid).

* * *

PHOTO-ELECTRIC controls and a wide range of industrial electronic equipment are described in an illustrated brochure issued by the British Thomson-Houston Co., describing its exhibits at the Mechanical Handling Exhibition, Olympia, London, which ends today.

* * *

DISTINCTION between the two main types of analysers—the indicating and tunable filter class—is explained by H. G. Yates, M.A., in an article on the Muirhead-Pametrada audio-frequency wave analyser in " Technique " (Vol. 4, No. 2) (Muirhead & Co., Ltd., Beckenham, Kent).

* * *

THE chemistry and mode of action of Heparin, and its sources, preparation, standardisation and various forms of administration and application are described in a booklet now available from Evans Medical Supplies, Ltd., Speke, Liverpool.

* * *

A USEFUL and extremely versatile range of photo-electric and electronic equipment is described in the new series of leaflets produced by Radiovisor Parent, Ltd., London, N.W.1. These include a new photo-electric press guard and the recently developed type FR49 Flamestat flame control device for the protection of industrial gas-fired ovens and similar installations. Other leaflets deal with units for indicating the density of smoke emission from chimney stacks, counting moving articles on conveyors, automatically controlling the switching of street lights. and the protection of premises against burglary by infra-red rays. Other applications of invisible ray monitoring system include automatic fire detection, the control of hopper filling, the detection of turbidity in liquids, control of atmospheric visibility, detection of dust leakage, automatic door opening, control of work temperature during certain welding and pre-heating operations. There appear to be specialised applications for almost every trade.

RESISTANCE to sudden stresses and heavy impacts and the long-wearing properties of manganese steel are stressed in an article in the current issue of " Edgar Allen News " (Edgar Allen & Co., Ltd., Sheffield). The series of articles on " Modern Welding Technique " by E. T. Gill and Eric W. Simons is continued.

* * *

THE appearance on June 15 of the first post-war edition of " England " (Ernest Benn, Ltd.) is an event in the history of a series of guide books which, under L. Russell Muirhead's direction, has come to be regarded as the most authoritative. The new Blue Guide to England offers in small and concise form all the essential facts required by business people, holiday-makers, and visitors. In its newly revised form, " England " is completely contemporary, taking account of the latest transport and hotel arrangements, and includes alterations to maps and plans made necessary by the war.

Standardised Safety Gloves

A FURTHER British Standard specification for industrial safety gloves (THE CHEMICAL AGE, 62, 584) just issued by the British Standards Institution (B.S. 1651: 1950), deals with safety gloves, mittens and handguards for protection against common hazards in all industries. This standard is based on practical trials lasting several years. It is designed to canalise the demand for safety gloves from more than 200 different types now commonly supplied, each type in several sizes, into a range of 17 preferred types, each supplied in a minimum range of sizes. This standardisation aims at facilitating economic production as well as the ordering and stocking of safety gloves. The gloves specified are designed to provide adequate protection, and to overcome weak points existing in the past so as to provide the greatest economy in use.

The gloves fall into five groups: leather, plastics, rubber, felt, and cotton. The standard includes a list of hazards and recommends the appropriate types of gloves for each hazard. Requirements are given for materials, sizes, manufactures and methods of test. Recommendations on the storage and preservation of rubber gloves are included, and a note on the information to be given when ordering gloves.

OVERSEAS CHEMISTRY AND INDUSTRY

NEW TRENDS AT THE MELLON INSTITUTE

Over $3.5 million for Research in 1949

AMPLE indications that the productive U.S. centre of fundamental and applied science research, the Mellon Institute in Pittsburgh, has lost none of its wonted vigour, are contained in the 37th annual report of the director, E. R. Weidlein, on the work during the year ended February 28.

Although expenditure is perhaps the least certain indication of the amount of worthwhile activity, it is interesting to note that the Mellon Institute spent over $3.52 million on pure and applied research in 12 months to March, 1949. Over $1.18 million additionally was devoted as the year's contribution to the long continuing scheme to increase the scope for research by addition of laboratories and ancillary buildings. This block, of four floors, on which work has been going on since 1948, will provide in the end 32 more laboratories, including 22 large ones, and a wide range of subsidiary accommodation.

Biochemistry and Schizophrenia

One of the principal studies in the pure chemistry research programme during the year has been in collaboration with the Illinois Neuropsychiatric Institute (L. J. Meduna) concerning the biochemistry of mental patients, in the course of which some highly original observations have been recorded in biochemistry associated with schizophrenics. A common factor, exhibited by approximately 33 per cent of such mental sufferers, was resistance to insulin. The Mellon department of research in Pure Chemistry has been concerned to isolate and indicate the active principle of an undefined chemical substance derived from the urine of these patients. It is thought to be the anti-insulin factor and it is noted that it produces a large rise in blood sugar when injected into animals.

The pure chemistry department is following the obvious invitation to illuminate, if possible from the chemical standpoint, the likelihood of association between diabetics and mental disorder, *via* the common characteristics of defective metabolism of carbohydrate. The possibility of wider understanding of the cause of human diabetes mellitus is suggested by the evidence already acquired that injection of alloxan in animals induces experimental diabetes.

These studies and a new procedure for the precise determination of alloxan monohydrate in biological materials are only some aspects of an elaborate programme which may conceivably establish highly unconventional fields for chemotherapy.

Notwithstanding the emphasis which continues to be given to many aspects of pure chemistry, the Mellon Institute's great importance as a centre of applied sciences substantially increased during 1949. The many applied science departments now have a staff of 266 Fellows and 248 assistants concerned with 84 fellowships enjoying industrial support.

The number of fellowships in applied science was increased by 12 during 1949. The subjects of the new research are as follows: agglomeration, aromatic anhydrides, arsenic, friction applications, mine-acid treatment, monomers, nickel derivatives, phenolic chemicals, pipe joints, sodium derivatives, special resins and zymology.

Mellon Principles in India

THE outstanding record of the Mellon Institute, since 1913, in promoting progress in industries is acknowledged as being the inspiration of India's recently completed Shri Ram Institute for Industrial Research. To reproduce some similar achievements in India, Sir Shri Ram, formerly chairman of the Delhi Cloth and General Mills, Co., Ltd., Delhi, is stated to have made over his entire savings to establish the institute.

The institute building houses very modern research equipment purchased in England and the U.S.A. and has most up-to-date laboratory facilities. It is the first institute of its kind in India to lay full emphasis on applied and industrial research. Particular stress is being laid on process development work, for which extensive pilot plant machinery has been installed, this also from Britain and America. The general objective is to give an incentive to the rapid development of Indian industries and the foundation proposes to investigate very immediate and long range technical problems. The institute will incidentally also provide Indian industries with experienced research-minded technicians.

FIRE-RETARDING COATINGS

Slower Burning Aircraft Fabric

COATINGS which are said to double the time interval between ignition and destruction of aircraft fabric have been developed in the U.S.A., where it is thought they may substantially reduce some fire hazards.

The tautening of aircraft fabrics is done by using inflammable cellulose derivative dopes. Fire retardant coatings are neither as effective or as permanent, so their application would require to be deferred until after the doping and with due regard for aerodynamic smoothness, adhesion, flexibility and other considerations.

The account of this work, given in the current issue of the *Journal of the Franklin Institute* (249, 2, 409) states that scale wind tunnel tests were carried out on 15 coating systems. Test panels, 12-in. square, with six coats of cellulose acetate butyrate and from one to four coats of fire retardant lacquer were placed in the centre of a steel wing suspended in a 70 m.p.h. air stream.

Aviation spirit was introduced into the air stream in a uniform spray and spark-ignited. The wing section was thus enveloped in burning spirit, ensuring continuous contact with flame during the entire test. The time for destruction of the outer coating and the time of fabric failure were noted; temperatures were recorded by thermocouples and rapid-recording pyrometers.

These tests are said to have indicated that the time for fabric destruction can be increased from the 6 seconds characteristic of cellulose acetate butyrate, to 12 seconds.

Fire retardancy is increased for higher pigment contents but these are not sufficiently durable.

U.S. Innovations

ELECTRICAL insulation claimed to last 10 times longer than any previous types has been developed by the (U.S.) Westinghouse Electric Corporation. It consists of mica flakes embedded in heat-resistant resin which will expand and contract with heat changes in the generator coils.

* * *

A NEW sludge inhibitor, employing as its active principle a liquid form of di-tert-butyl-para-cresol produced by the U.S. Koppers Company, is said to increase the effective life of transformer insulating oils 14 times. The inhibitor will stabilise new and reclaimed oils.

SPAIN'S PHARMACEUTICALS

Developing Uses of Local Flora

RECENT progress of the pharmaceutical and allied branches of Spain's chemical industry were evidenced recently in a paper by A. O. Villalonga, president of the Official College of Pharmacists, of Palma. He pointed out that in the last few years some 6000 drugs and medicaments had ceased to be imported into Spain and were now produced by the country's own manufacturers. He claimed that for most drugs Spain was now independent of the foreign producer. The occasion was the second Semana Farmaceutica Nacional, held in Palma de Mallorca recently.

That this progress may be to an important extent linked with the increasing attention now being given in Spain to the medicinal plants which flourish in certain districts, was suggested by several other papers. Prof. R. St. M. Casamada, whose subject was phytotherapy and its possibilities, offered the opinion that these plants could be considerably developed. He presented examples from both the native and foreign flora for production of anti-malarials, cardiotonics, antibiotics, etc. Among productions from native flora were some anti-malarials of a new type said to be much more potent than the quinines.

Plant chemistry was also the main theme of Prof. Rivas Goday, of Madrid University, in his paper on phytography in which he described the scope of applied botany at the university, including bromatology and biochemistry and its various relations with pharmacy.

A third paper on this subject, by Prof. Perello, of Madrid University, on the pharmaceutical physiology of plants, contained a record of much original work on plant breeding and crossing for medicinal purposes, the production of hybrids by artificial fertilisation and other methods, and other work in this direction during the past three years.

U.S.S.R. Rejects the Cell Concept

The Soviet Academy of Sciences has decided to ban the belief that cells represent the basic form of living matter. It is "a false reactionary theory and a survival of idealism." According to Moscow Radio, the Russian biologist Olga Borisovna Lepeshinskaya "has proved that cells can arise not only from cells but also from living non-cellular matter, which in turn is formed from inanimate matter."

BRITISH AND GERMAN CHEMISTS CONFER

Growing Range of West Zone Production

FURTHER substantial gains in output have been reported by many German chemical manufacturers. The peak production that followed devaluation in November was not overtaken by West German industry as a whole until April, although the output of dyestuffs, soda ash and many other chemicals in March was already 20-30 per cent higher than in that month. March exports of pharmaceuticals amounted to nearly double the November value.

For seasonal reasons, the expansion was particularly marked for fertilisers, but the demand for ammonium sulphate and various nitrates was met without delays throughout April and May, and it is believed that total consumption of nitrogenous fertilisers in the agricultural year ending now will be slightly below 1948-49.

Shipments abroad of chemical products substantially increased during recent months, so much so that the potash industry, for example, had to work overtime and Sunday shifts to meet export as well as domestic demands; the export demand for rock salt, on the other hand, is still insufficient.

The situation in the electro-chemical industry is characterised by the statement of Sued-Chemie AG that the highest prewar export figures have recently been far exceeded; the company has made plans for substantial plant extensions.

Import Restrictions

Some concern is being felt, however, by chemical exporters because of the evident inability of the Federal authorities to keep foreign trade in balance. Import restrictions by foreign countries have affected German export opportunities, with the result that German purchases of overseas raw materials may have to be cut. It has been impossible to cover the cost of rock phosphates from North Africa by exports of German manufactures to France. Similar difficulties have arisen in trade with Italy, while negotiations are now in progress with Chile to facilitate German purchases of saltpetre under clearing arrangements.

West German industrialists are waiting with marked interest for the outcome of the Anglo-German trade negotiations. German Press reports refer to the meeting in Cologne in the latter part of May between representatives of the Association of British Chemical Manufacturers and spokesmen of the German parallel organisation, Arbeitsgemeinschaft Chemische Industrie. At this third meeting since the war the British and German experts, according to the Press, surveyed in detail the situation of their respective industries and exchanged views on the repercussions of liberalisation of foreign trade. They also discussed specific questions concerning the exchange of goods between this country and Western Germany.

French Delegation

Discussions also took place " in a very friendly atmosphere " between a French delegation led by M. Brulfer of the organisation of the French chemical industry and a German delegation led by Herr W. A. Menne. These discussions were held in Frankfurt on June 1. Both sides, according to a semi-official statement, attached special value to an extensive exchange of information about the two organisations and to a discussion of the basic problems of intra-European and international trade.

The first contacts had shown that constant close and friendly contact was needed for a solution of the chemical problems arising within the framework of the intra-European economic relations, for which the initial steps have been taken, and that the conditions for such contact were " quite favourable."

The Allied High Commission have approved the German proposals for the conversion of the Krupp-Treibstoffwerk plant at Wanne-Eickel to the production of higher alcohols by the Oxyl synthesis process of Ruhrchemie AG, and arrangements were made immediately afterwards for co-operation between these two companies. The catalysts required will be made by Ruhrchemie AG at its catalyst plant, which has been idle since the end of 1949, while Krupp-Treibstoffwerk, GmbH, plans to produce a number of products for which it is hoped outlets will be found, as solvents for paints and lacquers, plasticisers for plastics, and auxiliary products for the detergent industry.

The German proposals also provided for the conversion of the Chemische Werke Bergkamen, the Fischer-Tropsch plant of Essener Steinkohle AG. Here, it had been suggested, operations for the purification of coke-oven gases and removal of poison-

(continued overleaf)

Brazil's Purchasing Programme

Large Sums for Health and Agriculture

BRAZIL'S Five-Year Plan, better known as the SALTE Plan, has been sanctioned by the President of the Republic and comes into force immediately. The plan aims at raising the national standard of health, increasing agricultural production, improving transportation and augmenting supplies of electrical energy and fuel. The total expenditure, equivalent to £427.5 millions, is to be spent in 1950-54.

The equivalent of £50.2 million is allotted to carrying out the first section of the programme, dealing with public health; £13.4 million is earmarked for disinfecting with DDT all zones subject to malaria along the coast and in low-lying valleys of the interior. Important sums are set aside for the purchase of medicines and for aiding Government laboratories and institutions to increase the volume and range of production of preventative and curative drugs.

The programme for expanding agricultural production provides for an expenditure of £52 million. This sum includes the equivalent of over £1 million for preliminary studies and installation of plant to exploit the deposits of apatite at Araxá (Minas Geraes), Jacupiranga (San Paulo) and Camisão (Bahia), and of other mineral fertilisers; £950,000 for the purchase of fertilisers, and £760,000 for increasing production of vegetable substances which can be utilised as fertilisers. Considerable sums are allotted to the purchase of insecticides and fungicides, and to sprinklers and other apparatus for use in combating insect pests and plant disease. A further sum of £2,100,000 is to be expended to foster production and industrialisation of vegetable oils, resins and wax.

Although preference will be given to the purchase of materials locally as far as possible, very considerable quantities will have to be imported.

Apatite Deposits

The known apatite deposits in Brazil are represented as being almost inexhaustible. The reserves at Ipanema, San Paulo, are estimated at 740,000 tons, with 11 to 21 per cent of P_2O_5; those at Jacupiranga, San Paulo, which are to be fully investigated under the SALTE Plan, have a mineral content varying between 22 and 28 per cent. The Morro Serroba reserves, with a similar percentage, are calculated at 500,000 tons, and those at Araxá, Minas Geraes, at 100 million. The latter, and the deposit at Camisã,Bahia, and Monteiro, Paraiba, will be opened up industrially this year. These are only a few of the many deposits awaiting exploitation.

State Aid for Chilean Development

The Corporación de Fomento de la Producción, with the support of the Chilean Government, plans the considerable development of both the products and by-products of its Huachipato steel plant. The making of chemical products, refracory bricks, carbide and ferrous alloys is intended, as well as the installation of a zinc refinery, a cellulose factory and foundries for iron and steel.

BRITISH AND GERMAN CHEMISTS CONFER

(continued from previous page)

ous substances could usefully be carried out, but this suggestion has not yet been sanctioned. The cases of Gewerkschaft Victor, Castrop-Rauxel, which was converted to the production of nitrogenous fertilisers, and Krupp-Treibstoffwerk, for which the conversion plans have now been approved, were given priority because both these companies had retained their staffs.

Nothing has been heard lately about another conversion project drawn up by German experts for the use of Fischer-Tropsch plants exempted from dismantling for paraffin synthesis, which in the main yields solid paraffin. Meanwhile German coal-tar interests are pleading for a resumption of hydrogenation operations on the ground that this would bring about a complete transformation of the world market of coal-tar pitch and creosote oil which was the scene of Anglo-German competition.

Bakelite-Gesellschaft, the German company which has been making Bakelite plastics for the past 40 years, has erected a new factory at Pasing near Munich, where the full manufacturing programme of the former works at Erkner near Berlin (which was dismantled in 1945) is being carried on. Zellstoff-Fabrik Waldhof, Mannheim, has discontinued the production of yeast products for feeding purposes and is now engaged on laboratory preparations for the production of pharmaceutical preparations.

◆ OVERSEAS ◆

Soviet Aid for Polish Chemical Industry

Delivery of equipment for the Polish chemical industry is to be expedited by the Soviet Union. Under a six-year plan plants will be installed and equipped for the production of nitrate fertilisers, acetic and sulphuric acid and synthetic phenol.

High-Powered Supersonics

American chemical engineers, describing at the recent Boston meeting of the Institution of Chemical Engineers the acceleration of many physical and chemical processes by the use of ultrasonic waves, estimated that intense vibrations cause violent molecular oscillation within a solution with a force 250,000 times that of gravity.

German Chemicals in Belgium

Following the freeing of importation of German goods, Belgium is reported to have experienced a flood of chemicals, according to the Belgian chemical industry, which is asking the Government to intervene. German prices are reported to be about 30 per cent lower than those in Belgium, while some other common industrial chemicals were said to be from 25 to 50 per cent cheaper.

U.K. Distillation Plant for India

Complete equipment is being provided from Britain for the conversion, recently started, of the liquor distillery at Nasik into a power alcohol factory under the authority of the State Government of Bombay. The plant is expected to produce a million gal. annually and the provisional target for the industry calls for a production of 10 million gal. this year. Over 3.5 million gal. was produced in 1948 and 5 million gal. in the first nine months of 1949.

Planned Increase of Sodium Products

The annual report of the Brazilian government-controlled Cia. Nacional de Alcalis indicates that the present plan to erect a plant in the Cabo Frio area should provide an annual capacity of 100,000 tons of sodium carbonate, and the production of 45,000 tons of caustic soda, 33,000 tons of soda ash and smaller quantities of by-products. The project is expected to bring about a substantial reduction in Brazil's imports of caustic soda and soda ash, which require an annual expenditure of about Cr$ 200 million and Cr$ 80 million respectively.

U.S. Fuller's Earth

The output of fuller's earth in 1949 fell by 6 per cent to 320,906 short tons. This is still slightly greater than the five-year average 1945-49 which is 317,435 tons.

Norway's Aluminium Production

Production of aluminium in Norway last year was 35,000 tons, but a potential annual output of 90,000 tons is anticipated by Mr. Johan Murer, managing director of Norsk Aluminium Company, who believes that a good market will be found. The country's total production of aluminium this year is expected to reach 46,000 tons.

Asbestos Cables in Australia

The Cable Makers (Australia), Ltd., New South Wales, is producing asbestos insulated cables, under licence. The insulation is processed to withstand high temperatures and the material is impregnated with heat and moisture-proof cements. The construction of the insulation wall of the cables eliminates laps, joints and seams and the cables are stated to be impervious to deterioration from heat, fumes, oil, grease and vibration effects.

Sugar Company's Chemical Interests

Considerable chemical enterprise is being shown in Australia by a subsidiary of the Colonial Sugar Refining Co., CSR Chemicals, Ltd., at Rhodes. Plastic moulding powder is being made from imported flake and other basic chemicals for the plastic and rayon industries. A pharmaceutical section also went into production recently. CSR research chemists have pioneered processes for the manufacture of certain vitamins and other pharmaceuticals.

Norwegian Plastics

Norsk Hydro, Norway's largest chemical concern, and a pioneer in the field of nitrate fertilisers, is building a factory at Heröya for the production of urea. The output, which is expected to start this autumn, is to be sent to a factory operated by Norske Kunstharpikser, at Lilleström, for processing into carbamidene for subsequent making into finished plastic products. Another factory, at Odda in West Norway, is being built to produce diacyandiamide. This factory is British-owned, and the material will be exported to Britain for further processing, states the bulletin of the Royal Norwegian Information Service in London.

PERSONAL

New Textile Research Fellow

Mr. C. M. Keyworth, managing director of C. M. Keyworth & Co., Ltd., Leek, and a skilful research chemist, has been elected a Fellow of the Textile Institute. Mr. Keyworth has carried out research on mercerisation of mixed fabrics with cotton warps and acetate wefts; improvements in crease-resisting cotton and rayon fabrics; and the manufacture of dinitro o-cresol and dinitro a-naphthol for mothproofing purposes.

A non-ferrous metals team, including Mr. W. L. Govier (Broughton), Mr. J. A. Thompson and Mr. J. W. Wilkinson (Witton), of the I.C.I. Metals Division, sailed for America on June 9. On their return the team will present a report on their two months' tour of U.S. non-ferrous metal plants.

Professor M. L. E. Oliphant, announcing this week his intention to sail for Australia on July 11, to take up his appointment as director of the School of Physical Sciences, Australian National University, Canberra, said Britain's largest atom splitter, the 1000 ton proton-synchroton, being built at Birmingham University, is nearing completion.

Recipients of recent presentations for long service staff and employees of Evans Medical Supplies, Ltd., were Mr. G. E. Shaw, of the Evans Biological Institute (25 years); Mr. J. Gregson, drug buyer, head office (25 years); Mr. J. P. Cargill, London representative (40 years); and Mr. G. R. Davies, representative in Australia (25 years).

The following Parliamentary members have been elected to the Parliamentary and Scientific Committee: Lord Calverley, Colonel Cyril Banks, Sir Harold Roper and Mr. Austen Albu.

The new president of the Pharmaceutical Society is Mr. Adam Meldrum, Aberdeen, and the vice-president Mr. Frank Wilson, secretary of the Surrey Pharmaceutical Committee, Wimbledon.

Dr. Vannevar Bush, the American atomic scientist, was among those on whom honorary degrees were conferred at Cambridge University last week. The public orator (Mr. W. K. C. Guthrie, Fellow of Peterhouse) referred to the doctor's co-ordination of various branches of scientific work during the war. Another American honoured was Dr. W. S. Middleton, president of the American College of Physicians.

NEW OFFICERS

Choice of Pesticides Groups

THE following officers and executive committee members will serve during the ensuing year:—

ASSOCIATION OF BRITISH INSECTICIDE MANUFACTURERS *Chairman*: Dr. J. R. Booer (F. W. Berk & Co., Ltd.); *vice-chairman*: Dr. E. Holmes (Plant Protection, Ltd.); *hon. treasurer*: Mr. N. K. Smith (The Murphy Chemical Co., Ltd.); *hon. auditor*: Mr. A. G. Ponton (Pan Britannica Industries, Ltd.). *Executive Committee*: Messrs. E. T. Bugge (Bugges Insecticides, Ltd.); R. V. Craven (W. J. Craven & Co., Ltd.); A. T. Davey (Burt, Boulton & Haywood, Ltd.); H. J. Jones (Hemingway & Co., Ltd.); N. K. Smith (The Murphy Chemical Co., Ltd.); F. W. Sugden (Plant Protection, Ltd.). *Secretary*: Mr. W. A. Williams.

ASSOCIATION OF BRITISH SHEEP AND CATTLE DIP MANUFACTURERS announces these appointments: *Chairman*: Mr. V. G. Gibbs (William Pearson, Ltd.); *vice-chairman*: Mr. R. Lowe (Chas. Lowe & Co. (Manchester), Ltd.); *hon. treasurer*: Mr. W. E. O. Walker-Leigh (Cooper, McDougall & Robertson, Ltd.); *hon. auditor*: Mr. R. J. Hope (Standardised Disinfectants, Ltd.). *Erecutive Committee*: Messrs. F. W. Barker (Battle Hayward & Bower, Ltd.); R. J. Hope (Standardised Disinfectants, Ltd.); R. W. Lowe (Chas. Lowe & Co. (Manchester), Ltd.); W. M. Macmillan (Robert Young & Co., Ltd.); D. O. Marshall (Osmond & Sons, Ltd.); A. S. Roxburgh (Roxburgh Morgan & Co., Ltd.); H. O. Waller (Cooper, McDougall & Robertson, Ltd.). *Secretary*: Mr. W. A. Williams.

Fatal Fire at Tar Distillers

AS a result of an accident at the Knottingley works of the Yorkshire Tar Distillers, Ltd., recently, Mr. Alex J. Robertson, 58, research chemist, of Springfield Avenue, Knottingley, lost his life, and his assistant, Harold Chisem, 21-year-old student chemist, of Eastfield Avenue, Knottingley, was taken to Pontefract General Infirmary seriously ill with extensive burns.

Another young assistant, Albert Shay, who was in the laboratory at the time of the accident, said that he had heard liquid gushing from a fusion pot, but was unable to see either of the men at first because of the smoke. He later saw Mr. Robertson emerge with his clothes ablaze. He indicated that his assistant was still in the building. Although both men received immediate attention, Mr. Robertson died within half-an-hour. A native of Surrey, Mr. Robertson had worked for the Yorkshire Tar Distillers for over 20 years.

MOF Appointments

The Minister of Food has approved the appointment of Mr. G. D. Lundie as Secretary of the Food Standards Committee from June 18, 1950, in succession to Mr. K. R. Allen who is being seconded to the Treasury. Mr. B. W. Smith has been appointed secretary of the Metallic Contamination Sub-Committee.

BIRTHDAY HONOURS

Recognition of Science and Industry

Sir Ben Lockspeiser (K.C.B.)

Mr. George Legh-Jones (Knight)

THE principal award to a scientist in the King's Birthday Honours List, published last week, was the promotion to Knight Commander in the Order of the Bath of Sir Ben Lockspeiser, LL.D., M.I.Mech.E., F.R.Ae.S., F.R.S., Secretary, Department of Scientific and Industrial Research. The importance of science and technology to industry is recognised in the list, which included the following:—

Knights

George Legh-Jones, managing director, Shell Transport and Trading Co., Ltd.

James Eckersley Myers, O.B.E., D.Sc., A.R.I.C., principal, Manchester College of Technology.

John Keay, chairman, English China Clays, Ltd., for services to china clay and housing industries in Cornwall.

Order of the Bath

K.C.B.

Sir Ben Lockspeiser, Secretary, DSIR.

C.B.

Eric Henry Edwardes Havelock, C.B.E., lately administrative secretary of the Agricultural Research Council. Secretary of the Development Commission. Terence Robert Beaumont Sanders, M.I.C.E., M.I.Mech.E., assistant controller of supplies, Ministry of Supply.

Order of the British Empire

C.B.E.

Arthur Joseph Amor, M.D., M.Sc., principal medical officer, Imperial Chemical Industries, Ltd.

Prof. T. J. Jenkin, director of the Welsh Plant Breeding Station, Aberystwyth. H. King, lately head of the Chemistry Division, National Institute for Medical Research. J. R. K. Paterson, director, Holt Radium Institute, Manchester. E. A. Shearing, assistant secretary, Ministry of Fuel and Power. C. A. Spencer, deputy chief scientific officer, DSIR.

O.B.E.

W. W. Davies, senior principal scientific officer, DSIR. J. H. Devine, principal executive officer, Board of Trade. John Henry Garner, F.R.I.C., chief chemist, West Riding Rivers Board, 1928, chief inspector 1924 until 1949. W. H. Glass, technical director, Thermotank, Ltd., Glasgow. H. G. Lamont, senior principal scientific officer, Ministry of Agriculture, N. Ireland. W. J. Picken, principal scientific officer, Department of Physical Research, Admiralty. F. Sproxton, technical director, B.X. Plastics, Ltd., Colchester. F. V. Tideswell, senior principal scientific officer, Ministry of Fuel and Power.

M.B.E.

Charles Alexander Beaton, design engineer, Monsanto Chemicals, Ltd., Denbighshire. Mrs. L. K. Boughton, assistant, Agricultural Research Council. Leonard Forbes, higher executive officer, DSIR. John James Hanton Hastings, A.R.I.C., manager, Research and Development Division, Distillers Company (Biochemicals), Ltd., Speke, Liverpool. (For services in the production of penicillin).

Manchester Electronics Exhibition

The fifth annual Electronics Exhibition organised by the North Western Branch of the Institution of Electronics will be held at the College of Technology, Manchester, on July 18 and 19. Admission will be by ticket, from Mr. A. Hickson, 205, Parrs Wood Road South, East Didsbury, Manchester, 20.

• HOME •

Cement Production Record

Output of cement in April reached 941,000 tons, which was 26,000 tons more than the previous record established in July. Stocks rose by 11,000 tons to a total of 214,000 tons, the highest level since June last.

Reads Relinquish Agency

Reads, Ltd., of Liverpool, has relinquished the sales agency of the Lima-Hamilton Corporation's sales agency (high-speed can making equipment) for many countries in Western Europe and North Africa.

Seaweed Recovery

Recent work by the Scottish Seaweed Research Association is stated to have solved many of the mechanical problems involved in the harvesting of seaweed. A new survey of seaweed resources is being started to cover an 11-mile stretch of the Dunbar coastline in East Scotland.

Steel Production in May

Despite the incidence of the Whitsun holiday, output of steel in May reached a record annual rate for the month of 16.597 million tons, compared with 16.409 million tons in May, 1949. Production of pig iron was at an annual rate of 9.646 million tons, against 9.7 million tons a year ago.

Zinc Price Again Raised

A further increase of £4 in the price of good ordinary brand zinc, from £123 10s. to £127 10s., delivered, was announced on June 13. The price has steadily risen since the beginning of the year when it was only £85 10s. Recent increases were on May 25 by £4 to £107 10s.; May 30 to £111 10s.; and June 5 to £123 10s. In accordance with the latest rise, prices of zinc oxide were increased by £3 10s. a ton for 2-ton lots, delivered. New rates are: Red seal £119; Green seal £120 10s.; White seal £121 10s.

Chemical Publicity

By the circulation of pictorial literature with the annual accounts, the directors of Evans Medical Supplies, Ltd., have this year perpetuated a novel idea of keeping the stockholders informed of the activities in which the company is currently engaged. With the accounts for 1949, recently issued, was enclosed a reprint from a trade journal of an article describing and illustrating the highly mechanised organisation and installations in that part of the firm's Speke works which carries out finishing and packing operations.

Changed Address

The Chemical Trade Journal removed its offices as from today (June 17) to 147-149 Grand Buildings, Trafalgar Square, London, W.C.2. (Telephone: Whitehall 1873).

Alpine Tour

The British Association of Chemists announced last week-end that there remained a few vacancies for the Chamonix-Mont Blanc tour which the Association is organising, July 30-August 14.

Bottled Gas Development

Scottish Rural Gas, Ltd., of Perthshire Chemical Works, Perth, is to build a factory and offices at Sighthill Industrial Estate at a cost of some £12,500. The company was a pioneer of widespread distribution of bottled gas in Scotland.

New Stage at Grangemouth

The second of two giant water-cooling towers to serve the £12 million Anglo-Iranian oil refinery development at Grangemouth (Stirlingshire) was completed on June 9. It is believed that the construction time of 13 weeks and three days is a world record for a structure of this size and character.

New Plating Plant

Charles Carpenter, Ltd., of Muirhall Road, Larbert, have now completed the construction of a modern plating plant, replacing their older premises on the same site. The new plant is handling a complete range of finishes for various industries, including a substantial volume of electrical industry work.

New Scottish Office

A branch office, at 183 Pitt Street, Glasgow, C.2, has been opened by Joseph Crosfield & Sons, Ltd., soap and chemical manufacturers, Warrington, following the retirement from business of Mr. J. M. Gifford (A. W. Wardrop & Co.), who previously represented the firm's products in Scotland.

Purchase Tax on Plastic Sheeting

Plastic sheeting, generally, is chargeable with purchase tax up to and including 0.015 in. in thickness, but certain types of sheetings are no longer regarded as chargeable. Those now exempt are non-pliable sheetings, paper-backed sheetings and sheetings over 0.012 in. in thickness with leather effects. This information replaces that on page 19 of Notice No. 78, under Group 7 of the Tax Schedule.

The Stock and Chemical Markets

ALTHOUGH profit-taking followed the recent further rise in industrial shares, stock markets have remained more active, and long-dated British Funds, notably 3½ per cent War Loan, were in demand in advance of the issue terms of British Coal stock, which are expected to be announced by the time these notes are in print. This issue will provide interim compensation for colliery companies in respect of nationalisation. It is expected to be followed by repayment of preference shares of some companies and by returns of capital for some ordinary shareholders.

Chemical and allied shares have taken their cue from Imperial Chemicals, which rallied to 41s. 7½d. following the annual meeting, where Lord McGowan referred to a substantial improvement in turnover both at home and abroad. Monsanto have changed hands around 48s. 6d. and Fisons held their rise to 26s. 3d. F. W. Berk further strengthened to 15s. 6d. and Bowman Chemical 4s. shares were 5s. 3d. Brotherton 10s. shares showed firmness at 19s. 6d. on the good impression created by the financial results.

Albright & Wilson 5s. ordinary have been dealt in around 28s. 3d., Amber Chemical 2s. shares were 3s. 3d., Boake Roberts 5s. shares were 26s. and Pest Control 5s. shares 7s. 9d. W. J. Bush 5 per cent preference were 22s. 3d. and British Chemical & Biologicals 4 per cent preference 16s. 9d. William Blythe 3s. shares have been dealt in at over 9s.

Lever & Unilever at 41s. 7½d. held most of their rise, partly owing to confident expectations of a coming announcement to increase the soap ration. The market now remains more hopeful that the Dutch Lever N.V. will be able to maintain its dividend, which would mean an unchanged payment for shareholders in the English company because of the dividend equalisation agreement between the two concerns.

United Molasses have eased to 43s. 9d., but Turner & Newall were active up to 85s. 3d. on hopes of a higher dividend later in the year. The last-named company, the chairman stated at the last meeting, would in future not abide by dividend limitation, but would pay dividends justified by the results of each year. The market is aware that the strong financial position enjoyed by the company has been built up by a prudent policy and is not expecting more than a modest increase in dividend.

British Oxygen shares have been active around 95s. 6d. Borax Consolidated rose further to 54s. 3d., and Dunlop Rubber eased to 62s. 9d. United Glass Bottle at 75s. have again moved in favour of holders and Triplex Glass were active at 23s. 9d. British Glues & Chemicals 4s. shares strengthened to 21s. 9d. Associated Cement were firm and active around 86s. 3d. and British Plaster Board 5s. shares 16s. 6d. awaiting the dividend announcement.

Iron and steels were firm, helped by the new record rate of steel production established last month. Sentiment was unaffected by the Government's statement on its attitude to the Schuman plan for pooling Europe's steel and coal production. Guest Keen have risen further to 46s. 1½d., Stewarts & Lloyds were 55s. 10½d. and Dorman Long 30s. 10½d. Boots Drug changed hands around 50s., Glaxo Laboratories at 50s. 7½d. failed to hold best levels, and British Drug 5s. shares at 8s. were helped by the financial results. Oils were active but showed small movements apart from Ultramar, which were active up to 16s. 4½d. with the debentures substantially higher at £164.

Market Reports

THE volume of trade on the industrial chemicals market continues at a satisfactory level and a fair amount of new home business has been placed during the past week. Inquiries for shipment, too, have been on a good scale and the output generally appears to be adequate to meet all demands. Price movements have been comparatively few, with the exception of the non-ferrous metal compounds, a number of which have shown increases as a result of the higher prices for zinc and copper. A further increase in zinc metal and oxide prices has been announced this week. In the soda products section there has been a steady pressure for supplies of chlorate of soda, hyposulphite of soda and sulphide of soda, the last-named having recently advanced in price.

MANCHESTER.—Although the chemical trade will shortly be adversely affected by annual holiday stoppages at the textile mills and other consuming establishments in this part of the country, the past week has witnessed steady trading conditions on the Manchester market. The soda compounds and most other bread-and-butter lines are being taken up in good aggregate quantities under contracts and a fair number of additional inquiries from home

(continued on next page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HILGER & WATTS, LTD., London, S.E. scientific instrument makers. (M., 17/6/50.) May 16, £200,000 deb. stock and a premium of 1 per cent in certain events secured by a Trust Deed dated May 12, 1950; general charge. *Nil. April 4, 1950.

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 17/6/50.) May 17, £500 debs., part of a series already reg. *Nil. July 22, 1949.

LONGWORTH, ENTWISTLE, LTD., Manchester, manufacturers of germicides, etc. (M., 17/6/50.) May 13, £400 deb., to J. H. Longworth, Stockport; general charge. *Nil. Sept. 30, 1948.

Satisfaction

NEWBALL & MASON, LTD., Nottingham, manufacturing chemists. (M.S., 17/6/50.) Satisfaction May 16, that property (354 Mansfield Road, Notingham) comprised in a deb. reg. October 28, 1948, has been released from the charge.

Company News

Associated Lead Manufacturers, Ltd.

The trading profit of Associated Lead Manufacturers in 1949 was £1,280,000 (£472,200). The ordinary dividend has been raised from £170,000 to £282,000.

The British Drug Houses, Ltd.

Net profit for year ended December 31: £95,303 (£66,788 in 1948, £73,713 in 1947). The maintenance of the ordinary dividend at 6 per cent was recommended. A scheme has been introduced under which employees of the parent company receive for the first time a bonus calculated in relation to their earnings and to the company's profits.

Brotherton and Co., Ltd.

The first report since the business became a public company in January last year records net profit of £111,079 earned between February 19 to December 31. The ordinary interim of 3s. 6d. per share and the final 6s. 9d. per share per annum are projected.

Laporte Chemicals, Ltd.

Net profit for year ended March 31, 1950, £226,676 (£190,728). Final dividend recommended on ordinary stock of 6 per cent, making a total of 8¾ per cent on the increased capital.

Manchester Oil Refinery, Ltd.

Net profit £77,565, of which it is proposed to apply £20,898 to reduce the intangible assets from £48,898 to £20,000, is reported by Manchester Oil Refinery, Ltd. Initial ordinary dividend of 10 per cent less tax recommended. More than £95,000 is being provided out of profits for the year to meet current and future taxation. In his statement at the second annual ordinary general meeting, the chairman, Mr. H. Stuart Ebben, referred to this as " a sum which appears to your directors to constitute a crushing burden for a growing enterprise."

Shell Transport and Trading Co., Ltd.

Profit in 1949 was £4,828,919 (£4,377,490), of which £886,324 is being allocated to general reserve. The final dividend 5 per cent free of tax (same) brings the payment on the ordinary stock to 7½ per cent for the year.

C. C. Wakefield and Co., Ltd.

Trading profit for 1949 was £1,451,175 (£897,339). The total interim ordinary dividend (£62,562) and the final (£172,047) are unchanged.

Change of Name

The name of the Bexley Chemical Co., Ltd., has been changed to Rouse of Wigmore Street, Ltd.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

users as well as on export account have also been reported. The undertone is firm in almost all sections of the market.

GLASGOW.—Business in general has improved during the past week, and now that the amounts of freight adjustments have been taken into account in fixing prices consumers are realising that the additional charges are necessary and improved business is apparent. The export market has been rather dull.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Preparations containing alkali sulphides.—Ciba, Ltd. Feb. 18 1947. 639,998.

Vinyl inter-polymers.—B. F. Goodrich Co. Feb. 19 1947. 639,999.

Methods of making derivatives of N-(cyanoalkyl) dithiocarbamic acids, and the compounds resulting therefrom.—Monsanto Chemical Co. March 6 1947. 640,158.

Insecticides, and methods of application thereof.—Electrolux, Ltd. June 27 1947. 639,937.

Preparation of 4-aryl-4-aminomethyl-piperidine derivatives.—Sterling Drug, Inc. July 17 1947. 640,168.

Production of valuable products from solid carbonaceous materials.—Standard Oil Development Co., and J. C. Arnold. (Standard Oil Development Co.). July 7 1947. 640,096.

Production of guanidine nitrate.—Koppers Co., Inc. July 15 1947. 639,940.

Refining of fatty acids.—Synergic Foundation, Inc. July 17 1947. 639,941.

Utilisation of chryptochrystalline clays as fillers for rubber and other vulcanisable materials.—Compagnie Industrielle De Credit. July 24 1947. 640,169.

Method of producing ammonia from hydrogen and nitrogen.—S. O. B. Odelhog. July 29 1947. 640,170.

Method of producing biosynthetic anti-microbial substances. Upjohn Co. July 30 1947. 639,943.

Process for the dehydrogenation of hydrocarbons.—Universal Oil Products Co. Aug. 6 1947. 639,945.

Barbituric acids.—Sharp & Dohme, Inc. Aug. 7 1947. 639,946.

Hydrogenation of polyallyl alcohol.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 7 1947. 640,171.

Abrasion-resistant coating compositions containing polyethylene.—E. I. Du Pont de Nemours & Co. Sept. 10 1947. 640,177.

Dehydration of coal tar and similar products by distillation.—Soc. Pour l'Exploitation Des Procedes Ab-Der-Halden. Sept. 17 1947. 640,178.

Purification of alcohol.—Usines De Melle. Sept. 19 1947. 640,180.

Process for producing mono-alkylbenzenes and the mono-alkylbenzenes resulting from said process.—Monsanto Chemical Co. Oct. 9 1947. 640,040.

Methods of preparing compositions of matter and the compositions of matter resulting from said methods.—Velsicol Corporation. Oct. 13 1947. 640,183.

Method of producing sodium selenate.—Canadian Copper Refiners, Ltd. Nov. 4 1947. 640,187.

Cellulose ester compositions.—British Celanese, Ltd. Nov. 6 1947. 639,960.

Cellulose derivative compositions.—British Celanese, Ltd. Nov. 6 1947. 639,961.

Process of preparing dihydropyridine derivatives.—N.V. De Bataafsche Petroleum Maatschappij. Nov. 17 1947. 640,189.

Process for the production of melamine.—E. I. Du Pont de Nemours & Co. Dec 1 1947. 639,962.

Manufacture of nuclear halogenated N-dialkylaminoalkyl - N - phenylalkylphenylamines.—Ciba, Ltd. Dec. 5 1947. 640,050.

Manufacture of peroxidic compounds.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 11 1947. 640,192.

Stabilisation of aldehydes.—I.C.I., Ltd., and S. A. Lamb. Dec. 17 1948. 639,964.

Purification of gases.—Bournemouth Gas & Water Co. Jan. 10 1949. 640,065.

Process for producing dihydric alcohol modified melamine formaldehyde condensation products.—Bec, Koller & Co. (England), Ltd. Feb. 5 1948. 640,208.

Synthesis of oxygenated organic compounds.—Standard Oil Development Co. March 18 1948. 640,115.

Polymerisation of vinyl and vinylidene chlorides.—Distillers Co., Ltd., C. A. Brighton, D. Faulkner, S. Lustigman, and K. H. C. Bessant. March 30 1949. 640,120.

Recovery of chlorobenzene. — United States Rubber Co. April 16 1948. 640,213.

Method for preparing hydrogenation catalysts.—Procter & Gamble Co. May 27 1948. 639,972.

Process for the utilisation of solid carbonaceous fuels.—J. C. Arnold. (Standard Oil Development Co.). May 22 1946. 640,699.

Carbon black.—Columbian Carbon Co. Feb. 1 1947. 640,565.

Method for alkylating polystyrene.—Monsanto Chemical Co. March 24 1947. 640,566.

Manufacture of penicillin derivatives.—Merck & Co., Inc. April 3 1947. 640,713.

Mineral oil compositions.—Monsanto Chemical Co. April 11 1947. 640,567.

Process for preparing benzodioxane and benzothioxane compounds. — Monsanto Chemical Co. May 20 1947. 640,570.

Process for the manufacture of insecticides.—W. H. Manger, Jnr. May 23 1947. 640,715.

Production of dichlorostyrene copolymers.—Mathieson Alkali Works. July 11 1947. 640,572.

Production of iridium.—Mond Nickel Co., Ltd., A. R. Raper, and S. J. R. Fothergill. Sept. 28 1948. 640,577.

Lubricating compositions and preparation of co-polymers for use therein.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 6 1947. 640,578.

Anti-corrosive paint or varnish.—Hassle Apotekare P. Nordstroms Fabriker A/B. Oct. 17 1947. 640,729.

Process for the purification of ketones by distillation.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 29 1947. 640,581.

Protective coating for resisters.—Continental Carbon, Inc. Feb. 20 1948. 640,739.

Compositions comprising polymeric materials.—I.C.I., Ltd., D. H. Coffey, O. B. Edgar, T. J. Meyrick, and J. T. Watts. March 1 1949. 640,597.

Process for polymerising olefinic hydrocarbons.—Universal Oil Products Co. April 19 1948. 640,830.

Manufacture of interpolymers of styrene with oil-modified alkyd resins.—L. Berger & Sons, Ltd., L. E. Wakeford, and W. T. C. Hammond. May 5 1949. 640,832.

Production of organo-silicon derivatives. —Soc. Des Usines Chimiques Rhone-Poulenc. May 25 1948. 640,834.

Manufacture of interpolymers of styrene with unsaturated fatty acids and derivatives thereof.—L. Berger & Sons, Ltd., L. E. Wakeford, J. J. Sleightholme, and W. T. C. Hammond. May 19 1949. 640,836.

Polarographs.—Cambridge Instrument Co., Ltd., and G. Jessop. Aug. 9 1949. 640,768.

Manufacture of hard metal carbides and of hard metal compositions containing metal carbides for tools and working implements.—A. Johnson & Co. (London), Ltd., and E. A. Pokorny. May 14 1946. 640,497.

Stabilisation of edible and potable substances against oxidation.—J. E. Nyrop. Jan. 3 1946. 640,241.

Emulsion paints.—L. Berger & Sons, D. H. Hewitt, and L. A. Paxon. April 14 1947. 640,502.

Method for alkylating benzene.—Compagnie Française De Raffinage. July 11 1946. 640,243.

Distillation of tall oil.—Armour & Co. Aug. 19 1946. 640,244.

Processes for producing magnesium hydroxide from magnesium salts in aqueous solutions.—J. S. Seailles. Aug. 26 1946. 640,848.

Method for the preparation of synthetic hide.—J. Seraphim. Aug. 28 1946. 640,245.

Method of recovering tin and the product resulting therefrom.—A. H. Stevens. (Vulcan Detinning Co.). Oct. 31 1946. 640,352.

Control of temperature of reaction in the halogenation of olefinic hydrocarbons. —I.C.I., Ltd., and R. J. Young. Jan. 21 1948. 640,857.

Catalytic contact masses.—O. Reitlinger. Feb. 20 1947. 640,455.

Electrostatic precipitation plant.—W. C. Holmes & Co., Ltd., F. B. Sykes, and P. Pearson. March 5 1948. 640,456.

Method and apparatus for atomising metals or alloys.—Federal-Mogul Corporation. March 28 1947. 640,457.

Method and apparatus for ammoniation of phosphoric acid.—Manufactures De Produits Chimiques Du Nord Etablissements Kuhlmann. April 2 1947. 640,361.

Dehydrogenation process for the production of phenols.—I.C.I., Ltd., A. W. C. Taylor, H. N. Rose, and T. Alderson. April 7 1948. 640,363.

Process for decoloring thermoplastic materials composed on a polyvinyl halide basis.—N.V. Philips' Gloeilampenfabrieken. April 28 1947. 640,460.

Process for the preparation of unsaturated hydrocarbons from unsaturated aldehydes or ketones.—N.V. De Bataafsche Petroleum Maatschappij. May 9 1947. 640,260.

Process for the decomposition of hydrocarbons.—Hercules Powder Co. June 3 1947. 640,368.

Method and appliance for creating artificial fog, mist or smoke.—D. & P. Studios, Ltd., and A. J. Pauley. June 4 1948. 640,266.

Insecticidal composition.—Dow Chemical Co. June 20 1947. 640,371.

Soap composition and method of making the same.—H. F. Johnston. June 23 1948. 640,373.

Hydroxy fatty acid estolide ester-ethers. —I.C.I., Ltd., and E. G. Parry. June 23 1948. 640,464.

Method of preparing non-turbid homogeneous solutions and dispersions of colloids and products so prepared.—General Aniline & Film Corporation.—July 7 1947. 640,270.

Process for effecting catalysed exothermic reactions.—Universal Oil Products Co. July 22 1947. 640,466.

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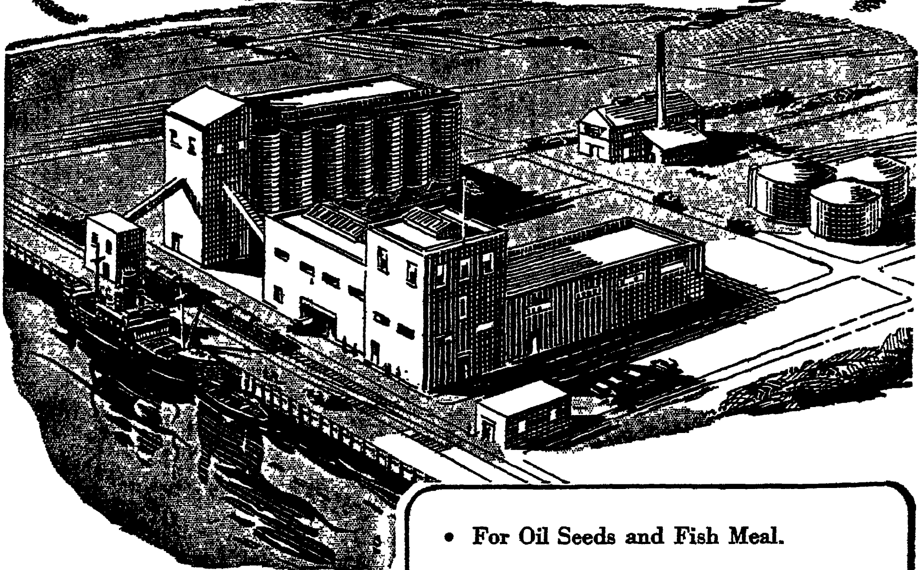

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28/4

TAXED TRANSPORT

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"NO other taxes could have been imposed which would have a more damaging effect on the country's economy; they should be withdrawn." This is the verdict of the British Road Federation, in an informative brochure entitled: "The Case against the extra 9d. a gallon Tax on Motor Fuel and 33⅓ per cent Purchase Tax on Commercial Vehicles." This makes clear that the tax on motor fuel, 1s. 6d. a gallon, is almost 100 per cent. Only semi-luxury articles have had to bear this amount of tax and there could be no possible justification for including motor fuel—which is essential to industry—in this category, states the federation.

It also publishes opinions from a number of its members, among whom the Road Emulsion Association says: "Replies from members estimate that increase on petrol will be between 5 per cent and 7 per cent on haulage costs, or just over 1d. per gallon on our materials. This is not taking into account the fuel used by executives and representatives, which will probably bring it up to about .25d. per gallon, when purchase tax on the commercial vehicles is taken into consideration.

These charges will undoubtedly have to be passed on to the customer as the industry is working on a very small margin and will not . . . be able to absorb these extra costs. One of our members who makes paints estimated that the increase in the cost of solvents, white spirit and naphtha, will make 10 per cent increase on the cost which they will have to pass on to the customer."

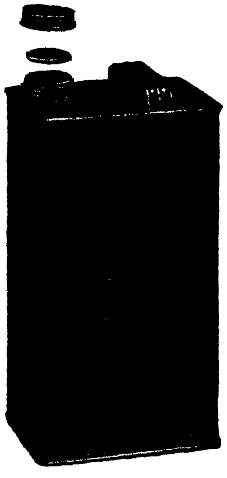
Conserving Coal Reserves

AT a meeting of the NCB Coke Oven National Consultative Council in London on June 6, Sir Charles Ellis recalled the foundation of the Coal Survey some years before the war, and observed that the service was now half as large again as it was when the board took over the mines in 1947.

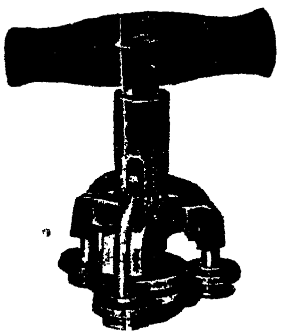
Dr. W. Idris Jones, Director-General of the NCB's scientific department, said that the board had reviewed all the coals in the country so as to make it easier to blend different qualities in coke ovens.

At the board's central research establishment, near Cheltenham, experimental coke ovens were being installed to enable the physical properties of coals suitable for coking to be studied for practical application.

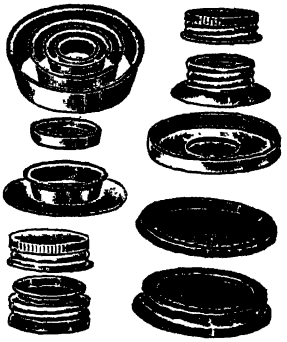
Tins for all Trades Home & Export



Square can showing
patent screw neck.
Patent No. 382,380



CAPSULING MACHINE



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Volume LXII 24 June 1950 Number 1615

Prospect of Seaweed Chemicals

NEARLY six years have elapsed since the start of the first practical undertaking on a substantial scale to make use of what promised to be a great natural reserve of organic chemical material, the several useful families of seaweed which proliferate around our coasts, particularly of Hebrides, Scotland and Wales. War conditions withheld from most people knowledge of the purpose and scope of what was planned and achieved then, so that the history of the seaweed industry in the U.K. appeared to have begun in 1947, the year in which the Scottish Seaweed Research Association's institute was opened at Musselburgh.

The rate at which this promising investigation has progressed must have appeared disappointingly slow to those who were aware of the extreme versatility and considerable value of the chemical constituents but could not visualise the extraordinary difficulties which nature imposes on those who have been trying to reap this sea harvest. The comparable problems of the mining engineer and mineralogist are, in fact, a good deal more amenable than wresting a natural crop, subject like inland harvests to season and weather, from an element which conspires with tides and rocks to defeat the efforts of the harvesters.

Those who know the nature and size of the problem of making the various kinds of marine algae as ample a source as they might be of alginic acid and the alginates, mannitol, laminarin and fuciodin and some other extracts for food, medicine and industry will not accuse the Institute of Seaweed Research of dilatoriness. Its new report reflects noteworthy advances in resolving the overriding mechanical problems as well as promoting interest and collaboration and defining new spheres of usefulness of the various seaweed substances. While figures alone are a rather sterile form of evidence, the knowledge that the number of firms originally sharing responsibilities with the SSRA—15—has doubled since operations started and that two are now about to begin harvesting indicates that the exploratory stage has passed and there are now prospects of important material results.

There are several other pointers of a statistical kind showing the same evidence. Scottish seaweed collection, amounting to some tens of thousands of tons annually, is now about seven times as large as the recovery five

On Other Pages

Leader:
Prospect of Seaweed Chemicals . . 907
Notes and Comments:
Destructive Radiation . . 909
An Irrational Tax . . 909
New pH Standard . . 909
Group Research . . 910
A Bad Shot . . 910
" Royal Dutch " Jubilee . . 911
SCI at Newcastle . . 911
Synthetic Rubber Without Styrene . 911
Parliamentary Topics . . 912
The First Census of Production . . 913
U.S. Salt Production . . 914
May's Large Chemical Exports . . 914
RIC Examination Results . . 915
The Toxic Factor in DDT . . 916
Industrial Uses of Radioactivity . . 919
The Colorimetric Determination of Manganese . . 920
Higher Fatty Alcohols . . 921
Impregnation of Porous Castings . . 922
Cooling Water Economy . . 923
The Case for Mechanical Handling . . 926

OVERSEAS CHEMISTRY AND INDUSTRY
German Materials for Chemical Industry . . 928
Brazil's Fertiliser Programme . . 929
Indian Fertilisers, Glass and Stainless Steel . . 930

Biological Hazards of Atomic Energy . . 934
Prices of British Chemical Products . 937
Technical News and Services . . 943

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

years ago, and the five companies which in 1944 were using seaweeds as a chemical source or as fertiliser have been joined by three others. The SSRA discloses, moreover, that the young British industry is not backward by standards of world production; over 20 per cent of the world's alginates are stated now to come from the U.K.

Much of the work even at this stage is concerned with fact finding, and the character of the evidence being accumulated by the association's chemical division, under Dr. W. A. P. Black, leaves little doubt that from the chemical standpoint the field can repay all the attention it is getting. It is apparent, for example, that the alginic acid now being successfully used commercially is only one of several derivatives, some of which may prove even more rewarding. Laminarin and mannitol are the subjects of most of the research in which Oxford, Cambridge and Edinburgh universities have joined the Scottish research department and the Scots have developed methods of extracting both substances in sufficiently high yields to justify the start of pilot plant work when the association's semi-technical laboratory is ready to operate later this summer. The early indications are reported to be decidedly promising, suggesting that together these two organic extracts may offer new source materials for synthetic resins, explosives, plasticisers and glucose. The overriding need, now that the main difficulties of mechanical harvesting of seaweeds have been satisfactorily overcome and laboratory techniques have provided the framework, is for an even more enterprising approach to commercial and technical possibilities. Chief responsibility for that will rest with the chemical and related industries, whose use of the sample extracts of mannitol and laminarin, in the knowledge that more than 200,000 tons can be had annually, should initiate new chemical production.

Should there be any doubt here about the wisdom of diverting industrial effort, and later investment, to pursue this opportunity it is clearly not shared by interests overseas. Convinced of the value of what has been revealed in Scotland, other countries are pursuing the same theme with little hesitation. The possibility of this country being left behind in another department in which it was a pioneer is not attractive.

Notes and Comments

Destructive Radiation

RECENT observations about the progress in making radioactive materials and procedures available to industry show that, while the promising facilities are not being imparted as quickly as might be wished, the experts are taking good care that hazardous materials do not become a source of danger in inexpert hands. There was a time when little regard was paid to risks of a similar sort and the serious injury by radium which was inflicted on some of those engaged in painting luminous dials showed how essential such precautions are. The close attention being given to ensure that nothing of that nature, conceivably on a very much more serious scale, results from freer distribution of what U.S. workers call "hot materials" is reflected in the subjects of several conferences to be held shortly, at which the emphasis is likely to be laid on the definition of what is safe—" maximum permissible levels," representing the degree of exposure which workers can tolerate with no apparent injury. The task of amplifying the meagre existing legislation on this unfamiliar subject and creating common industrial safety standards is evidently going to require deep cogitation. There is still relatively little evidence on which to base standards and what there is occasionally is as conflicting as the views held about the need for stringent regulations. It has been said, for example, that the experimental results by which safety levels are being determined may have been " multiplied by a factor of fear." That view is encouraged by the knowledge that some have withstood " deadly " exposure to radioactivity without any recognisable injury. This " hit and miss " characteristic is, however, no new thing. The approximate parallels to be found in the behaviour of high electrical energies and the respect that is universally shown for them justifies the caution which is the keynote of present policy.

An Irrational Tax

OF the richer examples of irrationality in fiscal affairs Purchase Tax legislation is an unfailing source. The humour of the unpremeditatedly Gilbertian results is, however, no consolation, for the principal victims, such firms as Reckett & Coleman, Ltd., some of whose attempts to distribute improved medical products are carried on under the oppressive shadow of the Chancellor of the Exchequer. That company's new analgesic, having found wide acceptance by doctors and hospitals last year, has since been made available to the public at large. To the private buyer its cost is exactly 33⅓ per cent more—the amount of Purchase Tax—than the price of the larger dispensing packs on which professional users need pay no tax. It would be iniquitous if they did. Is it any less iniquitous to create what the Chancellor might term " a disincentive to private enterprise " in the improvement of public health? Both the new analgesic and the antiseptic Dettol are tax-free in dispensing packs to dispensers, doctors and hospitals, but taxed on sale to the individual who may elect to treat a headache or a cut finger without recourse to the National Health Service. The ultimate absurdity of the system was exposed by Mr. J. B. Upton, chairman, at the annual meeting of Reckitt & Coleman: " Antiseptics for personal and medicinal use bear Purchase tax, while household disinfectants are tax free."

New *p*H Standard

A NEW step by the British Standards Institution should be of great assistance in ultimately securing international agreement upon the definition of a *p*H value. The institution has prepared a standard *p*H scale (B.S. 1647: 1950) which agrees closely with the scale already proposed in the United States. The original definition of *p*H value gave the mathematical expression $-\log_{10}C_H$, where C is the hydrogen ion concentration. Recent work has shown that the rigid use of this definition prevents *p*H from being measured, and that, to be a measurable quantity, *p*H cannot have any exact simple fundamental significance. An arbitrary definition has been adopted, which, it is hoped, will ensure that, when different workers refer to a stated measured value of *p*H, their figures will agree with an accuracy of ± 0.005. The standard allows, however, that such an accuracy is possible only when dealing with aqueous solutions at temperature between 0° C. and 60° C., and that highly active materials, such as oxidising agents, tend to reduce it. The primary standard chosen is a one-twentieth molar solution of pure potassium phthalate, with a defined *p*H of 4 at 15° C. The new derivation is such, that if expressed in the correct units, the *p*H difference between two solutions is a pure number. A study of the specification shows that adoption of this new definition, within the prescribed limits, gives the expression $pH = -\log_{10}C_H f_1 + 0.02$, where f_1 denotes the mean activity coefficient of a typical univalent electrolyte in the solution. This will enable practical measurements to be made accurately.

Group Research

THE conspicuous advantages of collaboration and mutual aid, as represented by the industrial group, are among the more important factors in production affairs at the moment. The attractiveness of widely based technological research and the pooling of results is especially well exemplified in the Dunlop organisation, whose director of production, Mr. A. Healey, has recorded the considerable debt the group owes to its many technologists. He told the staff of the new Dunlop research centre there had been no hesitation on the part of those responsible in ploughing back into the fertile field of research and development the very large sum of money required. They were being obliged to abandon the old conception of a parent factory and associated factories. The newer, and still expanding, conception of a group permitted the collection at the centre of reports from all over the world—the troubles with rubber parts of milking machines in New Zealand, developments in chemical plants in Rhodesia, the performance of tyres in Belgium, in Switzerland, in India, the use of synthetic rubber in tyres and tubes in U.S.A. and Canada. Thus was accumulated a great volume of information, of experience, and, more important than all else, a facility of judgment. From a hundred centres flowed in suggestions, criticisms, ideas, the result of a policy of encouraging initiative and enterprise while yet demanding the full use of the group's main resources of technique and experience in many fields.

A Bad Shot

A PARAGRAPH in a London evening paper last week made a daring, some will say foolhardy, incursion into metallurgy on behalf of one section of the sporting fraternity. The sports writer notified those who delight in putting the shot that the familiar and ponderous piece of iron about six inches in diameter may be replaced by something of golf ball proportions, made of osmium (sp. g. 22.48). That should represent surprising news for the sportsmen concerned, but less surprising than the writer's addendum for the scientifically minded that the metal concerned is $(NH_4)_2\ Ir\ Cl_6$. The latter, noting that this must represent a fairly bulky compound requiring perhaps a small sack or drum and devoid of osmium or even iron, may be excused if they give up putting these sort of chemical "shot" in favour of a cleaner pastime.

Synthetic Cortisone Research

Plants from Nigeria are now being subjected to chemical examination by the Medical Research Council at Mill Hill in connection with cortisone research. About one hundredweight of seeds of *Strophanthus sarementosis* and half a hundredweight of *Strophanthus hispidus* were recently brought back to this country by an expedition, headed by Dr. R. K. Callow of the Medical Research Council, which has spent some six months of field work in the western provinces of Nigeria.

"ROYAL DUTCH" JUBILEE

Celebrations at The Hague

THE Royal Dutch Petroleum Company—its original title was The Royal Dutch Company for the Working of Oil Wells in the Netherlands Indies—was established on June 16, 1890, to acquire a concession obtained by a Dutch planter from the Sultan of Langkat in North-East Sumatra.

The alliance with the Shell Transport and Trading Co., Ltd., founded by Marcus Samuel in 1897, dates from 1902 and originally covered only the Far Eastern trade. In February, 1907, the Royal Dutch / Shell Group came into being—a full merger of Royal Dutch and Shell interests—and has since developed to its present stature as a world-wide enterprise.

A series of celebrations to mark the Diamond Jubilee of the company began in The Hague last Friday with an official dinner, at which Prince Bernhard of the Netherlands was guest of honour, attended by members of the Dutch Government and colleagues from the Shell Transport and Trading Co., London.

A major event was the opening by Prof. Van den Brink, Minister of Economic Affairs, of an exhibition at The Hague depicting "Sixty Years of the Royal Dutch."

Representatives from all Shell's European companies have been invited to attend an International Sports Festival at the Royal Dutch / Shell Sports Club, Te Werve, near The Hague.

Among the celebrations at The Hague will be a photographic display "Holland through British Eyes," prepared by the Shell Photograph Unit.

Synthetic Rubber without Styrene

A NEW synthetic rubber, for which it is predicted that it may end the shortage of man-made rubber, has been developed by the Phillips Petroleum Company, Bartlesville, Oklahoma. Called polybutadiene or PB rubber, the synthetic is made from butadiene and requires no styrene. The production of butadiene can be increased in existing plants to meet the present heavy demand for synthetics, the company states. Limited road tests indicate that it may prove superior to previous synthetics and perhaps to natural rubber for tyre treads. It may even be equal to "cold rubber." A softer polybutadiene was obtained under moderately low temperatures.

SCI AT NEWCASTLE

Papers and Works Visits

THE 69th annual assembly of the Society of Chemical Industry is to be held at Newcastle-on-Tyne, from July 10 to 14 inclusive. An ample programme of events includes a number of visits to chemical and other works and research establishments, and lectures on technical subjects.

Papers to be presented include:—Wednesday, July 12: "Some Consequences of a Virile Chemical Industry on Food Processing," by J. B. M. Coppock; "Recent Advances in Plastics and Polymers," by H. V. Potter; "Insecticidal Phosphorus Compounds," by B. Topley. Thursday, July 13: "The Manufacture of Ammonium Sulphate from Anhydrite," by G. I. Higson; "The Aluminium Industry," by T. G. Pearson. Friday, July 14: "Some Aspects of Bitumen Roads in America," by A. R. Lee; "Trends in the Development of Dyestuffs Technology," by J. Baddiley.

Among the establishments to be visited are: King's College Agricultural Experimental Station, at Cockle Park; British Oxyen Co., Ltd., Chester-le-Street; Adamsez, Ltd., sanitary engineers, Scotswood; Spillers, Ltd., millers; Pyrex Glass Works; British Periclase Co., Ltd.; Washington Chemical Co.; Consett Iron Co.; Tyne Brand Products, Ltd.; British Paints, Ltd.; International Paints, Ltd., Felling-on-Tyne; Lemington Glass Works, Ltd.; Thos. Hedley and Co. Ltd., soap manufacturers; I.C.I. Ltd., Prudhoe; Associated Lead Manufacturers, Ltd.; I.C.I. Ltd., Billingham; I.C.I. Ltd., Wilton; Sir Howard Grubb, Parsons and Co., optical instrument makers.

An informal reception of members by the chairman, Mr. E. M. Myers, and Mrs. Myers, will take place at the headquarters of the society on July 10 followed next day by a reception by the council of King's College.

Fertiliser Society Papers

A general meeting of the Fertiliser Society will be held in Bristol on June 28. The morning programme will include the reading of two papers, "The determination of mineral micro-nutrients in soils using *Aspergillus niger*" by Dr. D. J. D. Nicholas, and "The production of micro-nutrient deficiencies in plants grown in sand culture, and the effects of some of these deficiencies on plant growth" by Dr. E. J. Hewitt.

Parliamentary Topics

REPLYING to a question about developments in the U.S.A. in the distillation of oil from coal, Mr. Herbert Morrison, Lord President of the Council, in a written answer said that the Director of Fuel Research had just returned from America where he had taken part in discussions on this subject. Production of oil from coal by carbonisation and by synthesis had been studied for some time in this country by the Fuel Research Station of the DSIR and by industry.

* * *

IN a written answer Mr. Noel Baker, Minister of Fuel and Power stated that in the forecast of dollar expenditure in 1950 prepared last December, it was estimated that the British controlled oil companies would spend $585 million in 1950, and would receive for sales of oil outside the sterling area foreign currencies worth £330 million.

* * *

IN REPLY to questions about BCG vaccine as a tuberculosis immuniser, Mr. A. Bevan, Minister of Health, stated that a trial use was being made in selected cases, but he was advised that the vaccine was not suitable for indiscriminate use. The tests were being watched by the Ministry with a good deal of expectancy.

* * *

REASONS for the increased incidence of anthrax were stated in a written answer by Mr. T. Williams, Minister of Agriculture, as largely due to the increased imports of fertilisers and animal feeding stuffs from abroad. In England there were 108 outbreaks in 1947, 95 in 1948, 204 in 1949, and there had so far been 149 this year.

* * *

A NEW clause to permit duty-free importations for industrial research—was moved by Mr. G. Bottomley, Secretary, Department of Overseas Trade, during the committee stage of the Finance Bill. The clause, designed to permit British manufacturers to import goods made in foreign countries for the purpose of studying new ideas which might be incorporated in them, was read a second time and added to the Bill.

ENCOURAGEMENT of the use of fertilisers for improving grass and marginal land in Scotland was the subject of questions in the House of Commons last week. Mr. Hector McNeil, Secretary of State for Scotland, stated that information given referred to supplementary schemes, and systematic consultations had taken place with the National Farmers Union. The information, which the Minister circulated in the official report, was as follows:

* * *

FERTILISER SUBSIDY SCHEME (SCOTLAND)

1. *Grants for Fertilisers Applied to Grassland.*

(*a*) For fertilisers applied to grassland other than rough grazings and one-year leys, the grant will be one-third of the farmers' expenditure or 25s. per acre, whichever is less, limited in any year to one-half of the total area of such grassland on each farm. Grant will not be paid if the area on the farm under crop is considered to be insufficient.

(*b*) For fertilisers applied with the prior approval of the Agricultural Executive Committee to rough grazings, grant willl be paid at the same rate.

(*c*) For fertilisers applied on marginal, hill and upland farms to grassland that is to be used in the same season to provide silage, dried grass or hay . . . one third of expenditure. Maximum grant £2 per acre.

2. *Grants for Fertilisers Applied to Grassland after ploughing up.*

(*a*) For rough grazings and poor permanent pasture to be improved by direct re-seeding . . . one-half of expenditure. Maximum grant £2 per acre.

(*b*) For grassland ploughed up on farms listed as marginal and on semi-derelict land that is considered by the Agricultural Executive Committee to be capable of being brought into proper agricultural use . . . two-thirds of expenditure. Maximum grant £3 per acre.

(*c*) For rough grazing and poor permanent pasture that is ploughed and either put under a green crop to be eaten off by stock *or* fallowed, i.e., ploughed in the autumn and fallowed until the late summmer of the following year and properly cultivated to keep down weeds), before being re-seeded . . . two-thirds of expenditure. Maximum grant £3 per acre.

* * *

NO RESTRICTIONS exist on quantities of cement imported except in areas where there are currency difficulties, said Mr. R. R. Stokes, Minister of Works in a written answer. He was aware that 60,000 tons were to be imported between the latter part of May and the end of June. The bulk of cement exports went to sterling areas. During the first three months of 1950, 4754 tons were exported and total for the year might reach 20,000 tons.

* * *

A QUESTION addressed to the president of the Board of Trade, by Dr. B. Stross, regarding the manufacture of chlorine dioxide in the U.K., received the reply that the necessary plants were being installed but some time would elapse before all the flour mills were fully supplied. No chlorine dioxide was imported.

THE FIRST CENSUS OF PRODUCTION

A Summary of Preliminary Reports

SOME of the preliminary reports prepared for the Census of Production for 1948 have recently been published in the *Board of Trade Journal.* Among those covered are the coal tar products (Report No. 27), salt mines, brine pits and salt works (No. 28), starch (No. 30), polishes (No. 31), oils and grease (No. 32), sugar and glucose (No. 33) and paint and varnish (No. 35).

The report on the coal tar products trade relates to establishments engaged wholly or mainly in the manufacture by tar distillation of coal tar products other than dyes and dyestuffs. Any establishments in Northern Ireland are excluded in 1948; no production was recorded there in 1935 and 1937.

The general summary shows the number of establishments in 1948 as 77. Net output (in £'000) was: 4717 (1948); 3640 (1946); 1765 (1937) and 1293 (1935). Capital expenditure on plant and machinery in 1948 comprised £526,000 worth acquired new and £8000 worth second-hand; £27,000 worth was disposed of. Cost of new buildings (including extensions, etc.) acquired during the year amounted to £155,000.

Total numbers employed in 1948 were 6044, compared with 4336 in 1937 and 4057 in 1935.

Salt Industries

The report on salt mines, brine pits and salt works relates to establishments engaged wholly or mainly in the production of rock salt, salt from brine and table salt. Establishments in Northern Ireland are excluded in 1948. Separate particulars of the small output in Northern Ireland were not published in 1935.

The general summary shows the number of establishments in 1948 as 23 (in Great Britain) compared with 28 (United Kingdom) in 1935. Net output (in £'000) was 3683 in 1948, as against 771 in 1935. Capital expenditure in 1948 shows that £260,000 worth was acquired new and £4000 second-hand, while £5000 worth was disposed of. The cost of new buildings (including extensions etc.) acquired during the year amounted to £27,000.

Total numbers employed in 1948 were 5782 compared with 3777 in 1935.

The report on the paint and varnish trade covers the manufacture of paint, varnish, enamel, distemper, wood stain, artists' colours, etc. (but not pigments), and it estimated that the returns for 1948 cover about 98 per cent of the total.

The number of establishments increased from 286 in 1935 to 358 in 1948. Net output in (£'000) was 30,395 (1948), 10,142 (1937) and 9685 (1935). Plant and machinery acquired from capital expenditure during the year 1948 was valued at £1,325,000 new and £19,000 second-hand, while £47,000 worth was disposed of. The cost of new buildings (including extensions, etc.) amounted to £783,000.

The number employed in 1948 was 32,407, compared with 23,934 in 1937 and 22,188 in 1935.

Polishing Materials

Equivalent information in the polishes trade related to the manufacture of wax and other polishes of all types, canvas dressings and of cleansing and polishing cloths (prepared), and in the treatment of sponges. The number of establishments totalled 77 in 1948, twelve more than in 1935. Net output (in £'000) was 5117 (1948), 3494 (1937) and 3608 (1935). Capital expenditure included £93,000 worth of new, and £5000 worth of second-hand, plant and machinery acquired, while £3000 worth was disposed of. The cost of new buildings (including extensions, etc.) was £34,000. In 1948 the industry employed 5754 against 7041 in 1937 and 6959 in 1935.

The report on the starch trade relates to the manufacture of starch, cornflour, dextrine and laundry blue. The large quantities of maize starch and by-products produced in 1948 for the Ministry of Food appear in gross output as amounts charged for the work done and not at selling values; the corresponding amounts of materials supplied by the M. of F. are, therefore excluded from the total materials purchased and used.

There were 18 establishments in 1948, compared with 13 in 1935. Net output (in £'000) was 1464 (1948), 687 (1937), and 598 (1935). Plant and machinery acquired under capital expenditure was £72,000 worth new and £1000 worth second-hand, while £2000 worth was disposed of. The cost of new buildings (including extensions, etc.) during the year amounted to £42,000. Employment rose to 2496, compared with 1978 in 1937 and 1778 in 1935.

It is estimated that about 96 per cent of the total output of the oils and greases establishments is covered by the returns relating to the blending of mineral, animal or vegetable lubricating oils (except at refineries) and to the production of cycle and motor oils, cart grease, etc., and of dripping, suet, tallow, premier jus, oleo-stearine and other animal oils and greases and in the production and refining of cod liver oil. There were 160 establishments in 1948 in Great Britain, nine fewer than in 1935, which covered the United Kingdom. Net output (in £'000) was 8001 (1948), 4972 (1937) and 4750 (1935). Capital expenditure in 1948 comprised £230,000 worth of new and £25,000 worth of second-hand plant and machinery and the disposal of £6000 worth. Cost of new buildings (including extensions, etc.) during the year was £145,000.

Total numbers employed in 1948 were 9051 plus 12 working proprietors, compared with 8367 in 1937 and 7783 in 1935.

The sugar and glucose trade—the production or refining of sugar and the manufacture of syrup and treacle, molasses, invert sugar and glucose— accounted for 50 establishments in 1948, against 59 in 1935. The general summary shows the net output in 1948 was £14,106,000, compared with £5,526,000 in 1935. Capital expenditure in 1948 on plant and machinery required £1,162,000 and £3000 (second-hand); £34,000 worth was disposed of. The cost of new buildings and extensions was £337,000.

May's Large Chemical Exports

MAY chemical exports increased in value by £1,379,351 from £7,128,752 in April to £8,508,103. Total chemical manufactures (other than drugs and dyestuffs) increased from £3,854,667 to £4,594,578 and were slightly higher than in the corresponding month of 1949. Drugs and medicines showed distinct increases, maintaining the 1949 level, and dyestuffs exports exceeded the £1 million mark. Exports of caustic soda showed the largest individual increase —from £260,711 in April to £375,023.

The provisional figure for the value of all United Kingdom exports in May is announced to have been £188 million. This is £1.4 million less than the record March total. Imports, however, at £288.8 million were higher than in any previous month, being nearly £8 million above the March record. Exports to Canada reached a total of £12.4 million, and to the U.S.A. £8.2 million. In announcing these figures in the House, Mr. H. Wilson, President of the Board of Trade, said chemical exports to Canada had shown a "considerable" rise, and pottery and glass exports to that Dominion had created a new record at £750,000.

U.S. SALT PRODUCTION

Decrease of 5 per cent in 1949

OUTPUT of salt in the U.S.A. last year totalled 15,590,697 tons, a decrease of more than 800,000 short tons from the 1948 production. Salt was produced in the following 12 states, California, Kansas, Louisiana, Michigan, New Mexico, New York, Ohio, Oklahoma, Texas, Utah, Virginia and West Virginia. From these 59 per cent of the national output was contributed by Michigan, Ohio and New York.

There was no change in the basic methods of recovery. The largest quantities, in short tons, were: salt in brine (sold or used as such) 8,838,381; rock salt (bulk), 3,404,791; evaporated salt (bulk) vacuum pans 1,744,569.

The quantity of salt produced for the majority of broad uses declined in 1949. Soda ash consumption declined most of all by more than a million tons. Increases in some uses partially offset the decreases.

The total quantity of salt used for chlorine making in 1949 represented a new record, exceeding that in 1948 by well over half a million tons. More salt was used for water treatment and meat packing and several smaller uses.

A table of uses in the U.S. Bureau of Mines mineral market report (No.1848) includes the following details:—

Salt sold or used by producers in the U.S.A. in 1948 and 1949 (evaporated, rock and brine) by uses, in short tons

	1949	1948
Chlorine, bleaches chlorates etc.	3,434,437	2,838,028
Soda ash	6,255,342	7,392,248
Dyes and organic chemicals	108,706	183,274
Soap (precipitant)	37,276	44,202
Other chemicals	527,973	615,266
Table and household ...	627,780	672,987
Water treatment	491,378	446,956
Metallurgy	72,985	65,777

Phosphoric Acid as Boiler Cleaner

SUBSTANTIAL advantages were claimed for the use for boiler cleaning of inhibited phosphoric acid rather than the hydrochloric equivalent, by specialists from Pittsburg (T. E. Purcell and S. F. Whire) at the meeting of the American Society of Mechanical Engineers. Phosphoric acid can be boiled and will produce only negligible effect on the metal, the inhibitor being effective. There is very little corrosive film, even at temperatures higher than normal boiling point. A 5 per cent inhibited phosphoric acid solution boiling at atmospheric pressure was found to remove deposit very well, make very little attack on metal and leave a rust-resistant surface.

RIC EXAMINATION RESULTS

Eleven New Fellows Qualified in April

THE Royal Institute of Chemistry announces that the following were successful in the examinations held in April 1950.

Examination for the Fellowship:—

Branch C: Organic Chemistry, with special reference to High Polymers.

Hadley, Gordon.

Branch E: The Chemistry, including microscopy, of food and drugs and of water.

Finch, Roland Arthur, B.Sc. (Lond.). Harral, James Charles. Harris, Tennyson. Murfin, John Webster, B.Sc. (Lond.). Shearing, Leonard Albert, B.Sc. (Lond.). Stephenson, William Harold. Taylor, Leonard, B.Sc. (Lond.).

Branch H: General analytical chemistry.

Burke, Thomas Eric. Radford, Arthur John B.Sc. (Lond.).

Special examination in chemical spectroscopy.

Hartley, Henry Eric Rogerson.

New Associates

Bakes, William Eric, Municipal Technical College, Hull. Barron, Gordon, Tecnhical College, Sunderland. Brady, George William Forster, B.Sc. (Lond.), Technical College, Sunderland. Brookbank, John Anthony, B.A. (Cantab.), University of Cambridge, and Royal Technical College, Glasgow. Brown, Colin Willgoose, B.Sc. (Lond.), Royal Technical College, Salford. Burnell, William Henry, College of Technology, Leeds.

Chadwick, Derek Bagnall, Royal Technical College, Salford. Collins, Harold John, South-East Essex Technical College, Dagenham. Cottrell, Anthony Morris, Acton Technical College, London. Crane, William Marshall, South-West Essex Technical College, Walthamstow. Cunningham, James, Technical College, Paisley, and Royal Technical College, Glasgow.

Dalby, Arthur, College of Technology, Leeds. Davies, Benjamin, B.Sc. (Lond), Technical College, Cardiff, and Royal College of Science, London. Dewhurst, John, Technical College, Blackburn.

Edwards, Vaughan, Municipal Technical College, Hull. Exley, David Frank, Royal Technical College, Salford.

Farndon, John Ernest, The Polytechnic, Regent Street, London. Fletcher, Norman William, Royal Technical College, Salford. Foster, Roy Marshall, Royal Technical College, Salford.

Goodfellow, Geoffrey Ivor, B.Sc. (Lond.), Medway Technical College, Gillingham, and Harris Institute, Preston. Gorsuch, Thomas Talbot, B.Sc. (Lond.), The Polytechnic, Regent Street, London. Green, Bernard Edward, Municipal Technical College, Hull.

Hampson, Noel Arthur, B.Sc. (Lond.), Royal Technical College, Salford. Holmes, Alexander, B.Sc. (Lond.), A.R.C.S., Imperial College, London. Hough, Cyril David, University of Nottingham, and Nottingham and District Technical College.

Jackman, Geoffrey Baldwin, B.Sc. (Lond.), Royal Technical College, Salford. Jackson, Eric, College of Technology, Leeds. Jones, Alan Cecil, South-East Essex Technical College, Dagenham.

Kirby, Leonard, Municipal Technical College, Hull.

Langford, David Houlden, Municipal Technical College, Hull. Lanham, Edward Albert, B.Sc. (Lond.), South-East Essex Technical College, Dagenham. Larson, John Eric, Loughborough College, Loughborough. Lawrance, Derek Robert, Technical College, Coventry. Liggins, Tom, Technical College, Coventry.

MacLennan, Alastair Paterson, B.Sc. (Lond.), The Polytechnic, Regent Street, London.

Morton, Robert Ainsley, College of Technology, Leeds. Mountain, Albert, College of Technology, Leeds.

Norris, Richard Colin, B.Sc. (Liv.), The University and City College of Technology, Liverpool.

Palfrey, Walter, Royal Technical College, Salford. Passmore, Richard Ian Oliver, King's College and The Polytechnic, Regent Street, London.

Rand, John Arthur, City College of Technology, Liverpool. Ringe, James Peter, South-East Essex Technical College, Dagenham.

Shenton, Frank Cooke, College of Technology, Manchester, and Royal Technical College, Salford. Side, Derek Norman, Norwood Technical College, London. Singleton, Leslie, College of Technology, Leeds. Skull, Alan B.Sc. (Lond.), The Polytechnic, Regent Street, London. Smith, Ronald Gregson, City College of Technology, Liverpool. Stead, Cecil Vivian, B.Sc. (Lond.), Royal Technical College, Salford. Steel Alan Edward, College of Technology, Leeds. Stroud, Kenneth Cecil George, B.Sc. (Lond.), South-West Essex Technical College, Walthamstow. Swanwick, John Douglas, B.Sc. (Lond.), Queen Mary College and The Polytechnic, Regent Street, London.

Whitton, John Bryan, Municipal Technical College, Hull. Williams, Leslie, City College of Technology, Liverpool. Witty, Alan Ronald, Municipal Technical College, Hull.

"No Overtime Problems for Edison"

I SHALL never forget a day and a night I spent in Mr. Edison's laboratory when I was a young engineer. The picture I got of Mr. Edison at work relates to the point I want to make.*

First, this simple and unostentatious quality of success that is called work. Not a colourful or romantic qualification, but I know of very few men who have succeeded in any field without a lot of it. When Mr. Edison started a project he stayed with it —literally day and night—until he got some sort of an answer.

In that laboratory I was first struck with the fact that no one seemed to have any idea of going home at the end of the day. Some sandwiches and milk and coffee came in, but things went on. Two or three cot beds in the corner struck me as odd. "We take a little nap when we have to, but the work goes on until Mr. Edison is satisfied to quit, whenever that is," was the explanation.

No time clock, no movies, no dividend requirements, no bankers, and I might add, no labour union or overtime restrictions worried these determined pioneers as they followed their visions to the end.

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* Abstract from "Vision Knows No Boundaries," by William L. Batt, president, SKF Industries, Inc., at the Edward G. Budd Lecture to the Franklin Institute (*Jnl of the Franklin Institute*, 249, 5, 347.)

The Toxic Factor in DDT

by R. W. MONCREIFF

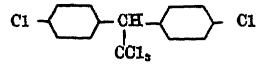
THE outstanding effectiveness of DDT as a lousicide in particular and as an insecticide in general has given rise to a good deal of speculation as to the factor to which it owes its toxicity. It might have been expected that the preparation of a considerable number of its analogues would soon have brought to light this essential structural feature, but although many such analogues have been made they have not enabled the question to be answered with any certainty. Still, to-day, work is being carried out to solve the problem and to establish the nature of the toxic factor. The evidence that is now available is considerable; it has in particular been augmented by reports of the behaviour of DDT-resistant strains of flies to analogues of DDT, and it does now seem possible to review the various theories that have been put forward, and to derive from this review some information that helps us to assess the role played by the several features of molecular architecture in determining the toxicity of the substance.

The Shape of the Molecule

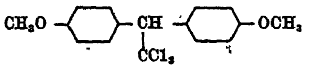
Many branches of chemistry have shown of recent years how important is the shape of the molecule. Evans[1] points out that direct dyestuffs have linear molecules often with reactive groups spaced at distances of 10.8Å, close to the cellulose repeat of 10.3Å; Jones and Pyman[2] have related pungency in amides to the general shape of the molecule and Slade[3] has suggested that the gamma isomer of benzene hexachloride (Gammexane) owes its peculiar efficacy as an insecticide to its ability to replace inositol; it is thought that the Gammexane molecule is very similar in size and shape to that of inositol, and that it can take up the position in the tissues of the insect that would normally be occupied by inositol so that there is no suitable site for this substance and some vital synthesis is blocked. The sulphonamide drugs can similarly masquerade as *p*-amino benzoic acid, occupy the position which that substance—an esssential intermediate in bacterial metabolism—would normally adopt and so prevent some vital synthesis, without which multiplication of the bacteria is impossible.

It was therefore natural to look for some similar mechanism to explain the behaviour of DDT. Probably, it was thought, DDT molecules were able through similarity of size and shape to take up positions ordinarily occupied by some insect metabolite. This view received considerable support when it was found that many of the analogues of DDT had potent insecticidal properties. Typical of these was Methoxychlor, a close relative of DDT and a product with very similar insecticidal properties. The characteristics of this substances have already been reviewed in this journal[4]; its structural similarity to DDT may be readily seen.

DDT



Methoxychlor



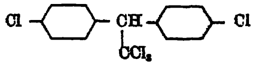
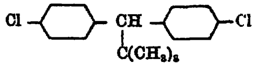
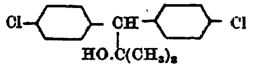
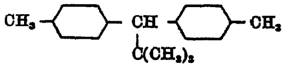
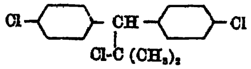
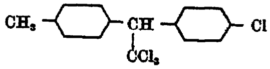
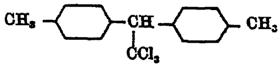
The fact that these two substances, so similar in molecular constitution, were similarly lethal to insects, combined with the known fact that other analogues were also insecticidal, certainly pointed to the molecular shape as being the essential characteristic for toxicity.

There were, however, some compounds also of fairly similar structure which showed little or no insecticidal activity, and this has for some time been disquieting for the supporters of the "shape of the molecule" theory. Now, quite recently, more evidence has been adduced to throw doubt on the view that the toxic properties of DDT are closely linked to the morphology of its molecule.

A communication from Skerrett, Stringer and Woodcock[5] relating to the insecticidal action of DDT appeared in a recent issue of *Nature*. These workers point out that if the toxicity of DDT is due to its structural resemblance to some essential intermediate in the insect's metabolism or to cholesterol, then substances which have molecules of similar shape should act similarly. The replacement, for example, of the chlorine atoms in the $-CCl_3$ group or in the phenyl positions by atoms or groups of similar size should not destroy the insecticidal activity. The methyl and hydroxyl groups are of similar size to the chlorine atoms, as this table shows:

Atom or group	*Radius in Ångstrom units*
Cl	1.7
OH	2.0
CH_3	1.7

Compounds were accordingly made in which hydroxyl and methyl groups were substituted for chlorine in DDT and the toxicity of the compounds tested against the grain weevil (*Calandra granaria L*) with the following results:

Compound	*Toxicity*
	(DDT) High
	Little or none
	Little or none
	Little or none
	Little or none
	Appreciable
	Appreciable

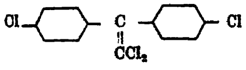
Evidently similarity of shape of molecule to DDT is not *per se* sufficient to confer insecticidal properties on the compound,, and some other explanation must be sought. If it were true that molecular shape was the determining factor it would be most unlikely that the substitution of three methyl groups for chlorine atoms on the —CCl_3 group would convert a high to a negligible toxicity.

Unreliable Parallel

It has to be remembered, however, that if a similar criterion were applied to benzene hexachloride the view that its insecticidal properties are due to the similarity of the shape of its molecule to that of inositol might not survive; no record exists, so far as the writer knows, of any insecticidal properties of hexahydrohexamethyl benzene, and if this substance should possess no marked insecticidal properties it would be difficult to sustain the view that those of Gammexane are due to the shape of the molecule.

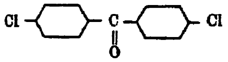
In any case, whether this view is correct or not for Gammexane, it is fairly evident that it is not correct for DDT and that we must look further for the true explanation.

Another theory that has received considerable support is that DDT is toxic to insects because it can readily lose hydrogen chloride. This view was probably first put forward by Martin and Wain[6]; they thought that the hydrogen chloride was the essential toxic substance and that the function of the *p*-chlorphenyl groups was merely to confer lipoid solubility on the substance, so that the DDT could penetrate the tissues of the insect and there to liberate hydrogen chloride. They pointed out that, although DDT is chemically unreactive and is stable to long boiling with water, it will readily lose hydrochloric acid to alcoholic alkali, or on heating to form $\alpha\alpha$-bis(4-chlorphenyl)-$\beta\beta$-dichlorethylene

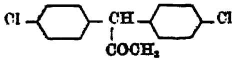


It might be objected that violent conditions are needed to bring about this loss of hydrogen chloride, but it must be remembered that, inspired by catalysts and enzymes, a great many reactions proceed smoothly and spontaneously *in vivo* which require extreme conditions for their promotion *in vitro*.

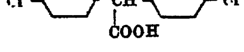
The unsaturated compound that results by loss of hydrogen chloride from DDT is almost inactive both as a contact and as a stomach insecticide and as Martin and Wain pointed out it cannot lose more hydrogen chloride. They also observed that 4 : 4 dichlorbenzophenone



was non-toxic to insects and Erlenmeyer, Bitterli and Sorkin[7] showed that 4:4′-dichloro-diphenylacetone

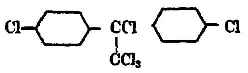


and 4. 4′-dichloro-diphenyl acetic acid

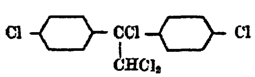


were also almost without toxicity to the housefly, the moth *Tinea granella* and the beetle *Dermestes frischii*. There was therefore some reason to associate the toxicity of DDT and related compounds with their ability to lose hydrogen chloride; analogous compounds which could not so lose hydrogen chloride appeared to lack potent insecticidal properties. Martin and Wain considered that the group $\begin{array}{c}\text{—CH—}\\ | \\ \text{CCl}_3\end{array}$ which could fairly readily lose hydrogen chloride was closely associated with the insecticidal activity of these substances.

Further evidence to support this view could be adduced from an earlier paper by Läuger *et al.*[5] of the Geigy Co. who had found that the compound

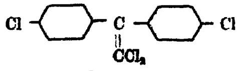


which could not lose hydrogen chloride had no insecticidal activity, whereas the compound



which could lose hydrogen chloride was a good insecticide.

As the derivative



was non-toxic although it presumably shared the permeativity of DDT, the toxicity of the latter was ascribed to the loss of hydrogen chloride.

In a more recent communication Martin and Wain[8] report that this view has been extended to benzene hexachloride, to chlorinated indanes and terpenes.

Now, insecticides which provide exceptions to this generalisation have been introduced by Julius Hyman & Co., of Denver, Colorado. Their "Compound 118" stated to be 1,2,3,4,10,10-hexachloro-1: 4, 5: 8 - diendomethane 1,4,4a,5,8,8a-hexahydronaphthalene is stable to alcoholic potash, a very powerful dehydrochlorinating agent and yet has an insecticidal activity of the same order as that of DDT. It is clear that in this instance the toxicity cannot be due to the loss of hydrogen chloride. Martin and Wain have examined it and have concluded that it has a mode of action dissimilar from that of DDT. The evidence on which this view is based is as follows:

(1) Adult *Calandra granaria* were made to walk on filter paper impregnated with oil solutions of DDT and of Compound 118 respectively, the relative magnitude of the median effective doses were:

After	68 hours	4.5 parts Compound 118	equivalent to 1 part DDT
,,	90 ,,	2.5	ditto
,,	120 ,,	1.0	ditto
,,	140 ,,	0.8	ditto

The difference in the speed of action is thought to support the view that the mechanism of the action is different.

(2) Difference in the reactions of the poisoned insects; as these differences are described it is not possible to assess the value of this evidence.

Inasmuch, however, as lipoid solubility is thought to be one of the essential factors it is not easy to see why differences in speed of action should be considered to indicate that the modes of action are different. There would appear to be no reason why the lipoid solubilities should not be different, in which case the less soluble product would presumably act more slowly or have a longer period of delay before it did act.

The figures that are given suggest to the present writer not that the modes of action are different, but rather that Compound 118 has a lower lipoid solubility than DDT, but that it is more highly toxic. It takes longer to act, but when it does act, *i.e.*, when solution has taken place in the lipoids to the seat of reaction, which may well be the nerve centres, then it acts more powerfully than DDT.

It seems quite possible that the view that the toxicity of DDT and of some related compounds is due to their ability to lose hydrogen chloride may have to be discarded. While it is always true that, owing to the potency of natural enzymes and catalysts, reaction may take place *in vivo* that are difficult to carry out *in vitro* except under very severe conditions, it seems rather unlikely that a compound which will not lose hydrochloric acid even to alcoholic potash, will lose it in the insect's body. It is not impossible, but *a priori* it is unlikely. The fact that both DDT and Compound 118 have very similar degrees of toxicity suggests, too, that the modes of action of the two insecticides are similar. Thus Martin and Wain (*loc cit.*) fed both (separately) to caterpillars of *Mamestra brassicae* and found the toxicities were:

DDT 0.098 to 0.142 mg. per gram larva;
Compound 118 0.274 to 0.286 mg. per gram larva.

But although Martin and Wain cling to their view that the insecticidal activity of DDT is due to its ability to lose hydrogen chloride (plus its lipoid solubility) and explain the activity of insecticides, which although they cannot at all easily lose hydrogen chloride, are nevertheless effective, as being due to a different mode of action, the matter does not rest there.

(*To be continued*)

REFERENCES

[1] D. T. Evans, " Fibre Science," 256 ; Manchester, 1949.
[2] E. C. S. Jones and F. L. Tyman, *Jnl. of the Chem. Soc.*. 1925, *127*, 2588.
[3] R. E. Slade, *Chem and Ind.*, 1495, *64*, 368.
[4] R. W. Moncreiff, *The Chemical Age*, 1949, *61*, 116-120.
[5] E. J. Skerrett, A. Stringer and D. Woodcock, *Nature*, 1950, *165*, 853.
[6] H. Martin and R. L. Wain, *Nature*. 1944, *154*, 511-512.
[7] H. Erlenmeyer, P. Bitterli and V. E. Sorkin, *Helv. Chim. Acta.*, 1948, *31*, 466, 70.
[8]. P. Laüger, H. Martin and P. Müller, *Helv. Chim. Acta*.. 1944, *27*, 892. 928.
[9]. Martin & Wain, *Nature*, 1949, *163*, 918.

INDUSTRIAL USES OF RADIOACTIVITY

Some Practical Applications of Beta Radiation

By K. FEARNSIDE, M.A.[*]

THE usefulness of radioactive tracer techniques in industry rests on the fundamental fact that as little as 10^{-16} grams of active phosphorous can be estimated to an accuracy of 1 per cent. In general the industrial applications are not elegant, since it is necessary for them to be handled by untrained people with little supervision. The essential point is to avoid all hazards.

Such applications are typified by two simple examples. P^{32} may be added to the melt in a blast furnace; samples are removed at intervals, and when all trace of P^{32} has disappeared it is known that all the phosphorus has gone from the melt.

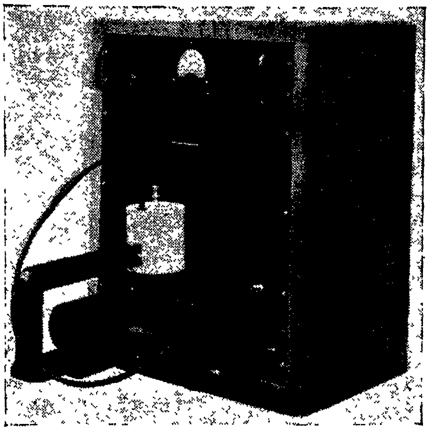
The second example was a piece of work carried out by Heyward Tylor at Luton in 1949. It was desired to find out how much wear could be expected, and where, on the 16-in. main bearing of a large pump designed for use in South America and other places where adequate oiling and maintenance could not be guaranteed.

The bearing weighed 12 kilograms and was too large for irradiation in the pile. A ⅛-in. shim was therefore made to fit on one end of the bearing and this was subjected to a bombardment of 8 by 10^{10} neutrons per sq. cm. per second in BEPO for a month. After being left for a week to " settle ", the shim was fitted to the bearing and the pump run for a day to settle down. All the oil was then changed.

Wear on Bearings

The pump was run under a series of test conditions, samples of the sump oil being taken at intervals. The activity in the oil was too small to be measured directly. The oil was therefore ashed and the ash exposed on a sensitive film for 48 hours. As a result of this piece of work it was possible to estimate the wear on the bearing to half a millionth of an inch. This was in 1949, and this figure could now be improved on.

These examples illustrate the general principles involved in the industrial application of radioactive isotopes. The detail of such application consist mainly of the development of particular gadgets. For these β radiation is normally used because it has an effective range in air of about a metre; the range of α radiation is only about 5 cm. in air.



[Courtesy of E. K. Cole, Ltd.

Radioactive gauge for measuring and, with suitable additional equipment, controlling the thickness of strip material

An example of such a gadget is a gauge used for measuring the weight per unit area of a material being produced in sheet form. As the β rays pass through the material the slower rays are stopped first; if the log of the count rate is plotted against the weight of the absorbing material the curve approaches complete absorption level asymptotically.

The indicating part of the industrial instrument using this principle consists of an electrical device based on a null method. Two cylindrical ionisation chambers are used; at one end of each P^{32} provides a source of β rays which in the one case pass through a standard sheet of known thickness and in the other case through the production material being measured. By this means it is possible to measure the weight per unit area with 1 per cent accuracy. The zero of the instrument must be checked about three times per day; this can be made to coincide conveniently with the change of shift.

(continued overleaf)

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[*] Summary of the contribution of Mr. K. Fearnside, (Isotope Developments, Ltd) at the discussion meeting in London on May 17, of the Society for Visiting Scientists under the chairmanship of Sir John Cockcroft. Other contributors to this discussion of " The Use of Radioactive Isotopes in Industry and Research " were Dr. W. J. Arrol and Dr. W. G. Marley.

The range of material thickness over which this device can at present be used is limited by the source of β radiation available; the range is now from 2 mgm/sq. cm. to 150 mgm/sq. cm. It is hoped that with a more powerful source of β rays this can be extended to 1 gm./sq. cm.

Another radioactive technique developed for industrial use is the employment of a detector for picking out incorrectly filled packages from the production line. A thin beam of β rays is produced by a collimater and impinges on a Geiger-Muller counter. The beam is so placed that it passes through the top of the filled packets as they pass along the conveyor; if the top of the packet is empty the counter registers a count. That signal can be used either to warn the operator or to throw out the faulty package.

An American example of the industrial use of β rays is a gadget for measuring the thickness of pipe walls. The proportion of the β rays which are reflected from a pipe wall depends on the thickness of material in the wall. This instrument is very useful in chemical plant and for studying boiler tubes, etc.

Another class of industrial application makes use of the ionisation of gas, especially air, by radioactive rays. This is particularly useful in the elimination of static electricity from sheet material passing between rollers. This static charge may be no more than a nuisance in a paper mill, but is dangerous in locations such as a plastics factory where large quantities of solvent are exposed.

The provision of a radioactive source underneath the sheet material provides a conductor to earth by ionising the air immediately below the sheet. In this country β radiation (range 1 m., energy 600 kV. is used; in America α radiation (range 5 cm., energy 5 mev.) is often used. It is noted that radiation may remove other atoms from the sheet material and attach them to the mounting of the source support or some other adjacent object—an obviously undesirable possibility.

The Colorimetric Determination of Manganese

A NEW method for accurate determination of small amounts of manganese has recently been reported by A. H. Cornfield and A. G. Pollard (*Journ. Sci. Food & Agric.*, 1950, *1*, 4, 107-109). The method has been developed for estimating manganese traces in plant and soil extracts, but it may be applicable or adaptable to other types of manganese determination.

It is well known that a blue colour is formed when $4:4'$-tetramethyldiaminophenylmethane (or " methane base ") and periodate are added to a solution containing manganese. Attempts to use this colour as the basis of a reliable quantitative colorimetric test failed, as the initial colour could not be stabilised. Five minutes or so after the blue reaction, however, a more stable green colour is formed. It has been found possible to use this stage of the reaction as the test basis. As little as 0.02 p.p.m. of Mn. in 25 ml. of test solution have been determined with ease and reproducibility.

For precise details of the method, reference should be made to the original paper. Briefly, the manganese containing solution is placed in a calibrated test-tube, 2 ml. of an acetate-acetic solution (prepared from NaOH and acetic acid) added, also 1 ml. of a KH_2PO_4 solution; this liquid is then diluted and brought to 20°C. Three ml. of fresh potassium periodate solution are added, the mixture shaken, and 1 ml. of the methane base reagent immediately added. The green colour formed must be measured after 10 minutes (± 1 min.) in a standard absorptiometer using the 2 cm. cell and the red light filter, RO2. The dark blue filter, OB1, gave the highest sensitivity but extinction values were found to tail off less sharply with the red filter.

Duplicate determinations showed that results were reproducible to within 10 per cent. The presence of acetate is essential for high sensitivity; free acid must be present to prevent precipitation of the methane base and phosphate ions are necessary to prevent interference from ferric iron. Temperature is important as the test sensitivity varies considerably for 5° C. changes; for consistency of results the test temperature of 20°C. was fixed as a standard.

Other ions present will interfere. Maximum amounts (as p.p.m.) of various ions which can be tolerated are as follows:—

Phosphate ...	200	Aluminium ...	2
Chloride	400	Copper	4
Sulphate	200	Lead	1
Nitrate	200	Arsenate	2
Calcium	200	Arsenite	4
Magnesium ...	80	Fluoride	16
Ferric iron ...	1		

NEW USES OF HIGHER FATTY ALCOHOLS

Some Recent Industrial Applications

From A CORRESPONDENT

FATTY alcohols, such as the saturated wax-like compounds cetyl and stearyl, and the unsaturated, oily substance, oleyl alcohol, are now finding important uses in several new industrial fields. Among the more conspicuous examples are those concerned with the production of hydrogenated lard, insecticidal dusts, oil paints, synthetic waxes, sludge inhibitors, cutting and lubricating oils, leather finishes, rust preventatives, wetting agents, dyestuffs, textile oils and sulphonates, oil-in-water emulsions, cosmetic preparations, foaming agents and synthetic detergents.

Apart from these acids there are many others with similar physical and chemical properties, *e.g.*, ceryl alcohol, carnaubyl alcohol, montanyl, ginnol, myricyl, lacceryl and psyllicyl alcohol. Although these higher fatty alcohols have been known to chemists for many years—cetyl alcohol was obtained by Chevreul from spermaceti (cetyl palmitate) over a century ago—it is only within the last decade that major industrial uses have been found for them. It is proposed to survey in some detail some of the more important properties and newer uses of cetyl, stearyl and oleyl, which are considered to be typical members of the series.

Properties of Cetyl Alcohol

Cetyl alcohol, $CH_3(CH_2)_{14}CH_2OH$, is a monohydric saturated alcohol with a waxy taste and practically no odour. It is stable in the presence of acids, alkalis, light and air. It is readily dissolved by a number of solvents, the most important being ethyl alcohol, aromatic hydrocarbons, carbon disulphide, chloroform, glycerine and diglycol ethers. It is miscible with mineral or vegetable oils, and fats, but insoluble in water. One commercial grade of cetyl alcohol containing 10 per cent stearyl alcohol has an iodine value less than 1; titre value 49° C. (120-2° F.); acetyl value 192-194 and saponification value 0.4. The melting point of pure cetyl alcohol is 49° C.

Stearyl alcohol, $CH_3(CH_2)_{16}CH_2OH$, closely resembles cetyl alcohol, and commercial grades of the latter usually contain small quantities of stearyl. The unsaturated alcohol, oleyl alcohol (actadecenyl, octadecenol), $CH_3(CH_2)_7CH = CH(CH_2)_7CH_2OH$, is a light yellow viscous liquid having a bland taste and slight odour. Like cetyl and stearyl alcohols, this compound is refined from the oils of the sperm whale under high vacuum distillation. Oleyl alcohol is very stable in the presence of acids, alkalis and air but darkens slightly after prolonged exposure to light. Generally, the solubility of oleyl alcohol closely resembles that of cetyl alcohol. A commercial grade of the unsaturated alcohol containing 5 per cent cetyl has an iodine value of 84-86: titre value 8° C. (46.4° F.): acetyl value 181-183 and a saponification value of 0.05.

As Suitable Additives

The higher fatty alcohols have properties in many ways similar to other oils, fats and waxes. They can be emulsified, sulphonated and compounded with other oleaginous materials. Here they show excellent stabilising effects, high foaming power and pleasant emollient properties, which make them suitable additives for toilet soaps, ointments, salves and suppositories.

In several processes manufacturers exploit certain characteristic properties of the higher aliphatic alcohols. The production of insecticidal dusts, including DDT, Gammexane, Toxaphene, etc., now utilises the excellent powder adhesion properties of cetyl and stearyl alcohols.

In the manufacture of hydrogenated lard and other shortening compounds the saturated alcohols are employed to increase water absorptions. In ointments and salves the alcohols help in dispersing drugs and antibiotics and their emulsifying, penetrating and emollient properties are also of value. These properties are further utilised in the production of creams, brushless soaps, lathering soaps, sunburn lotions, deodorants, cleansing lotions, cold and permanent wave solutions and hair shampoos. Oleyl and stearyl alcohols are able to exert valuable plasticising effects in the compounding of synthetic resins and production of stencil and carbon papers.

These alcohols also possess the property of lessening stickiness and tackiness in many oily and waxy formulations, as in the manufacture of master carbon paper for transfer reproduction processes; cutting oils; hydraulic fluids; sludge and rust

(continued overleaf)

Impregnation of Porous Castings

Good Results with Sodium Silicate

POROSITY of metal castings, particularly those of non-ferrous metals and alloys, presents additional difficulty when they are intended to contain liquids of great penetrating capacity, such as petrol, benzene, alcohols, etc. The traditional use of linseed oil and other pore-closing media under such conditions has been found to give satisfactory results only for a limited period, because solvents remove the oil.

Difficulties have also been encountered in attempts to reduce porosity by the use of aqueous solutions of metallic salts, which, after evaporation in a warm atmosphere, leave in the pores sealing inclusions of the salts. The most obvious difficulty involved is that of possible contamination of the liquids being handled. That strictly limits its technical and commercial value.

Consideration has been given to the use of sodium silicate, on account of its viscosity and capability of hardening when heated and its further advantage of being inert and relatively insoluble, except in warm water.

An article in *Chemie et Industrie*, *56*, 112, by A. Debecq, a translation of which has appeared in *Ceramic Age* (U.S.A.), states that a great many impregnating trials made with sodium silicate leave no doubt that it is quite a valuable corrective treatment for porous castings, provided that the treatment has been carried out carefully.

The article outlines a method of application that has been found to give good results in practice: Before treatment, the component parts are scrupulously cleaned of all traces of impurities (grease, oil, sand). The parts are heated to around 150-200° C. to ensure the removal of all moisture; then they are immersed in a small impregnation equipment.

After treatment, the parts are dried and then brushed to eliminate the final traces of silicate adhering to walls and to metal. Next, the parts can be machined and handled in the usual manner. In principle, it is necessary that the porous parts should be entirely immersed in a bath of sodium silicate, heated to 75-80°C., under an impregnation pressure of 25 kg. per sq. cm. The equipment may be assembled easily, using a small reservoir constructed of thick sheet or of cast iron, a steam heating coil, and a small, hand-operated pressure pumps of type used for testing boilers.

The sodium silicate used naturally is a primary factor in the process and should be chosen carefully for the purpose; it is necessary to use a neutral silicate of soda, of 38-40°Be (R :-3.3±).

It should be noted that the impregnation is not to be considered as an absolute remedy, as it gives good final results only in the case of castings with an average porosity. Generally speaking, if a first impregnation is not found to give a satisfactory result, it is necessary to scrap the part, because a casting that is too porous will often have a very low mechanical strength.

NEW USES OF HIGHER FATTY ALCOHOLS

(*continued from previous page*)

inhibitors and lubricatng oil. The preparation of lacquers and coatings based on nitrocellulose, cellulose acetate and ethyl cellulose largely depends on the presence of efficient solubilisers such as cetyl and stearyl alcohols, in the plasticiser-solvents mixture.

Apart from direct applications in soap and textile specialities, drugs, cosmetics and other compounds, the higher fatty alcohols are important as intermediates in the manufacture of dyestuffs, perfume esters, detergents, flotation reagents, germicides, etc. Bromo-acid dyes for lipsticks and oil-soluble germicides make use of stearyl and cetyl alcohols. In the new types of emulsifiers for synthetic rubber processing the fatty alcohols are converted to mercaptans or thioalcohols. One of the most important applications of fatty alcohols is in the formulation of special surface active agents possessing excellent wetting properties, good foaming and proved detergent ability.

Freezing Point of Eucalyptol BP

THE standard requirements of the British Pharmacopœia are challenged by Dr. W. Mitchell in the *Pharmaceutical Journal* (No. 4518, page 436). Dr. Mitchell states that the B.P. standard for freezing point of eucalyptol is unnecessarily stringent, difficult to attain in manufacture and to preserve under normal storage conditions. He suggests that, instead of the present standard (freezing point +0.3° to +1.2° C.), the former B.P. standard (freezing point not below 0°C.) should be re-adopted.

COOLING WATER ECONOMY

Practical Saving Devices in Chemical Processes

by LEO WALTER, A.M.I.Mech.E., M.Inst.F. etc.

THE incentives to save cooling water in a large or small chemical works are manifold. Mains water is costly and certainly not abundant and reduced demand from industry would release more for domestic purposes. Where water is pumped in a works generally power is required, drawn from the already overloaded electric grid system or the works power plant. Water pumped in a works from deep wells or rivers costs less than mains water, but by reducing the use of it considerable saving in money and power can still be procured. Statistics show that in many works more cooling water is used than for boiler feed and all other purposes.

The volume of cooling water used can be considerably reduced in the larger works by lowering the static pressure head in the distribution mains and employing the usual method of leaving fully open the hand control valves for cooling water supply. A reduced mains pressure will certainly cut down the rate of flow of uncontrolled cooling water supplies and effect a saving.

Fitting valve position indicators to hand control valves is another means of reducing consumption of cooling water. Instructions can be issued how to set hand control valves at each stage of a process with the help of an indicator for valve openings. That operation will, however, require some supervision by the foreman or plant engineer.

Carelessness in leaving cooling water control valves fully open, where ¾ or ½ openings would suffice, is responsible for much waste of water. That waste is not easy to detect unless visible means are fitted for ascertaining the valve position at a glance and from a distance.

Temperature Gradients

Cooling water volume can also be reduced by using the flow in various cooling coils or jackets in a sequence determined by the different temperature gradients. For example, cooling water from gas or oil engines, which may have been allowed to run to waste, might be conveniently used for cooling of jackets of high-temperature heat-flow processes, the cooling of furnace doors, firebars or for cooling coils in reaction vessels where a suitable temperature difference exists.

Another means of saving of cooling water is to replace open cooling water circuits, where the outgoing cooling water goes to waste, by closed circuits using evaporative coolers, cooling towers or ponds. The use of closed circuits with secondary cooling water flow is becoming now more or less standard treatment of cooling water from gas and oil engines, waste heat recovery methods reclaiming the heat contained in the out-going cooling water, the calorific value of which can be raised by heat recovery from the engine exhaust gases.

There is still too little appreciation of the waste of cooling water resulting from heat transfer surfaces of heat exchangers becoming scaled or fouled. The increase of cooling water required for badly maintained chemical condensers with hand control may sometimes exceed 50 per cent, compared with the cooling effect obtainable from clean surfaces for the same rate of heat extraction. Cleaning of cooling coils

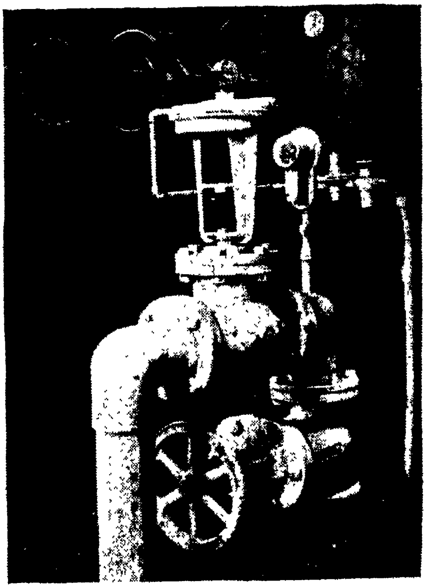


Figure 1

This article develops the theme dealt with in THE CHEMICAL AGE, 62, 159, 267 and 855.

or cooling jackets at regular periods, and frequent checking of heat transfer surfaces by preventive maintenance schemes are among the most important means for saving of cooling water.

Control to reduce the rate of cooling water flow automatically in accordance with the demand for cooling effect can be applied by a variety of methods. Whether gradual modes of control are used, by which the rate of flow is varied continuously in accordance with the demand for heat extraction, or the two-step or on/off control modes which temporarily cut off the flow of cooling water, the practical application of automatic means has beneficial effects on consumption and helps to produce better results from the process itself.

It is probably self evident that an automatic control instrument, if properly selected and correctly installed, is preferable to control action by the plant operator. A controller is always on the job and should achieve closer control than the best human operator.

A condition which it is well to bear in mind when it is decided to install automatic control is that the process may, in fact, require less stringent control than the works chemist or engineer may specify. While ideal conditions are attractive, they may be unnecessarily expensive to procure. Controllability depends on such things as process time lags, which in turn may be enforced by the plant design.

Automatic Control

A reasonably common problem is presented when water is used in a large works to cool gas ports in melting furnaces. The cooling water is supplied from a header tank, with a flow and return pipe and overflow. A self-actuated temperature regulator here would employ a thermostat bulb immersed in the header tank. The water control valve is reverse-acting, opening wider as the water temperature rises and closing when the temperature falls.

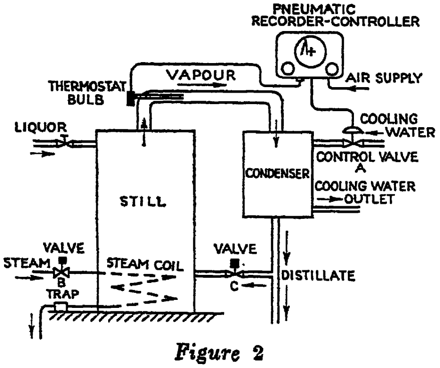


Figure 2

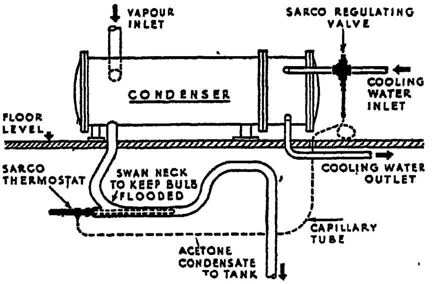


Figure 3

Towns mains water is used at a pressure which fluctuates between 30 and 60 psi. These fluctuations in supply pressure are detrimental for good control by hand, and obviously much water is wasted at higher supply pressures if the valves are not conscientiously readjusted by hand.

Pneumatic Thermostat

In an actual example five regulators of 1½ in. diameter were fitted to the plant, passing about 900 gal. per hour. The cooling water temperature is maintained at about 160° F., by using the indirect control method of obtaining control impulses from return water temperature, instead of from the point of cooling. Gas cooling towers are very large consumers of cooling water, requiring valves which will control 4-in., 6-in. or larger water supply mains. A pneumatic thermostat with its bulb immersed in the outlet gas mains will provide efficient gradual control of cooling water flow by a diaphragm control valve fitted in the main.

Gas coolers for gas producers required in one instance 44,000 gallons of cooling water per hour, delivered by a 6-in. bore main. It was decided to leave the basic flow for minimum cooling load uncontrolled, but to regulate automatically the fluctuating water volume according to demand for cooling action. This required two 2-in. and one 3-in. control valves in the split-up supply pipes to the coolers. Water temperature was 40° C. at 25 psi., and in this instance the method of controlling the fluctuating volume only worked well. It is, however, not always applicable.

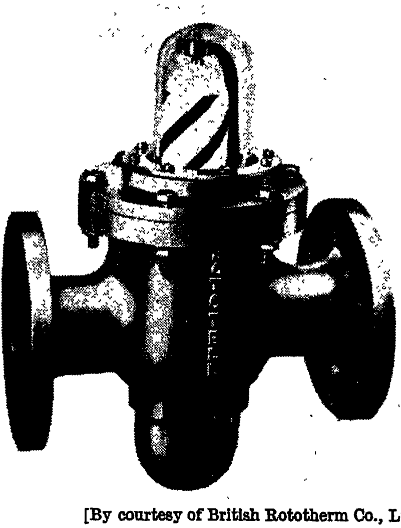
Condensers of distilling plant are also wasteful of water, but the main purpose of thermostatic control in such processes is to safeguard the distillation efficiency. Fig. 2 illustrates the scheme for automatic control of a distilling plant, using a pneumatic recorder-controller to operate a diaphragm control valve in the cooling water supply.

The thermostat bulb is inserted in an elbow of the vapour pipe from the distilling plant and the amount of admitted cooling water varies in proportion to temperature rise or drop of the vapours from the still. Alternative methods of control would be to regulate steam admixture to the heating coil (Valve B), or to regulate the return of distillate by means of valve C.

Acetone Condenser

Large condensers in manufacture of a great variety of chemical products lend themselves readily to thermostatic control. A simple layout scheme for cooling control of an acetone condenser is shown in Fig. 3, indicating the immersed thermostat bulb and the large self-actuated control valve respectively. This control holds the condenser temperature steady at the required set point and effects considerable saving of cooling water, compared with hand control. The process runs continuously without much fluctuation of cooling load and proportional control made is applicable, the control valve moving in strict proportion to temperature change.

The use of electrically operated temperature controllers may be sometimes convenient. A desirable precaution, which should always be taken where hand control of cooling water valves is performed, is to fit into the cooling water pipe an alarm signal apparatus or instrument. Fig. 4 shows the Rototell, a visible flow indicator with rotating signal member. A combination of contact thermometer and Rototell indicator safeguards any cooling water circuit from over-temperatures and/or lack of proper rate of flow. Contact thermometers can be used with advantage in conjunction with magnetic valves or motorised valves for on/off control.



[By courtesy of British Rototherm Co., Ltd.

Figure 4

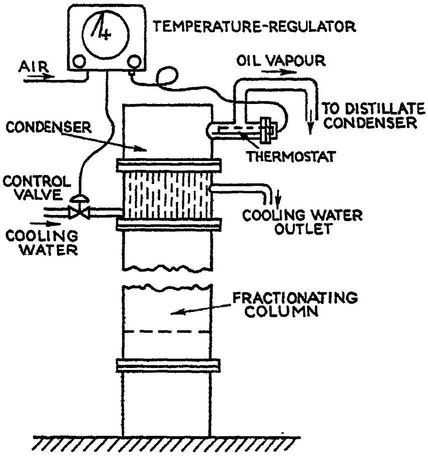


Figure 5

The control problem of fractionating columns is sometimes very difficult and may require elaborate engineered control. A comparatively straightforward undertaking is the provision of cooling water control of a water-cooled fractionating condenser (Fig. 5).

Importance of Correct Cooling

In benzol recovery plants the separation of the benzol from the fine traces of creosote or wash oil depends very much on correct cooling in the condenser mounted on the column. The temperature on top of this condenser is a measure for the product quality. A pneumatic recorder-controller of the automatic reset- type is shown, having the thermostat bulb immersed in the outgoing vapours and the control valve fitted in the cooling water supply.

There is not space to show in detail how cooling water can be saved in the jacket cooling of diesel engines or air compressors and the alternative heating and cooling of jacketed chemical reaction vessels. It should, however, be mentioned that used cooling water, if clean and otherwise suitable, can sometimes be used as boiler feed water with advantage and can be pumped by the use of steam surplus, thus saving cost of pumping water.

(continued at foot of page 927)

THE CASE FOR MECHANICAL HANDLING

A Monsanto Director's Views

THE convention sessions held in connection with the second Mechanical Handling Exhibition, at Olympia, London, which closed last Saturday, included a discussion on June 13 between Capt. Mark Hewitson, M.P., and Dr. W. H. Garrett, a director of Monsanto Chemicals, Ltd., on "Muscle or Machine?—The Introduction of Mechanical Aids."

In the course of his contribution, Dr. Garrett stressed that the primary objective at the moment of mechanical handling methods was the reduction of costs; but the subject also had an important secondary aspect in improving working conditions, and reducing the amount of heavy physical exertion required from the worker. Machines to do such work were usually fairly expensive. In industrial or commercial spheres, such capital investment had to be justified by a corresponding cost reduction. Such a lowering of cost cannot be achieved unless full advantage was taken of the reduction in manual labour which the machine makes possible.

The Manual Worker's Approach

It was not difficult to appreciate why the rank and file of manual workers look with suspicion on the introduction of a machine which enables one man to do the work previously done by ten, and ask what is to become of the redundant nine? It was less easy to understand, however, why leaders of the trade union movement, with a broader view of the whole economic picture, should adopt or encourage such suspicions.

The difference in the mental approach to mechanical methods as between the manual worker here and his counterpart in the U.S.A. was largely psychological and based on history. The American worker had behind him 100 years of a rapidly expanding economy, during which there has always been, until recent years, more work than men to do it. The result was a receptive attitude towards labour-saving devices. In this country there has been a period of 50 years during which, except for the two war periods, the fear of unemployment has been a real one.

None the less, it is no accident or coincidence that the most highly mechanised nation in the world was also the one with the highest standard of living, for modern mechanical methods, properly applied, do reduce the cost of goods to all, including the workers themselves. As a nation we were in a period of transition between pre-eminence in industrial manufacture, and the realisation that to survive even at our present standard of living we have to make goods that are at least as good and as cheap as those produced by a dozen other nations now competing for world markets.

"I believe," said Dr. Garrett, "that where a continuous, rather than a spasmodic, effort at cost improvement by modernising handling methods is adopted, it is not impossible to obtain the necessary co-operation from the workers concerned.

"Over the last 30 years British industry as a whole has not taken such full advantage of the modern methods of handling as has been the case in some other countries. This has been due, at least in part, to the fear on the part of employers that restrictive practices on the part of the workers will reduce or negative the possible savings in cost. This criticism does not apply where new factories are built, for, generally speaking, full application of new methods of handling is included in the engineering design, and there are no established practices to be upset. The difficulty arises when the question of modernising an existing operation is under review.

Restrictive Practices

"The Coal Board takes particular pride in the rate at which it is mechanising the mines. Why, then, should unions countenance restrictive practices when private enterprise attempts to follow a programme similar to that which has union support in nationalised industries?

"The national situation calls for enterprise on the part of employers, and a broadminded and far sighted outlook on the part of the unions if our costs are to be competitive in world markets and we are to maintain our present standards of employment.

"That mechanical handling methods can be of material assistance in this effort can be proved by a host of examples, but three in my personal knowledge will suffice.

"One company modernised its warehouses by introducing fork trucks, palletting, continuous belts, automatic packers and automatic weighers. Over a period of two years the number of employees in the warehouses fell from 140 to 46 though the tonnage handled increased by 23 per cent. The total number of employees in the factory rose over the two years by 170. Savings on warehouse operations are estimated at 22½ per cent, after full allowance for depreciation on equipment.

" Another company, handling pitch, introduced mechanical shovels, conveyor belts and automatic weighers. The number of men engaged on this unpleasant task was reduced from 45 to 12 in one year, but useful employment was found in the factory for all but six of the redundant men. Savings on pitch handling, again after allowing for depreciation, was 3s. per ton handled.

Coal Handling Rationalised

" A third firm mechanised its coal handling operations by introducing grabs for stockpiling, automatic wagon tilters, automatic weighing machines, and conveyors for direct boiler house supply. The number of men engaged previously on man-handling the coal was 28. This was reduced to four. All the redundant men were transferred to the engineering force of the factory, which was expanding. Savings on coal handling amounted to 3s. 4d. per ton net, which is quite a factor when you consider that the delivered price of coal to British factories is more than double the corresponding price of similar coal to U.S. factories.

" Admittedly, in these cases there was little or no final redundancy, but we must look at the question of redundancy on a wide basis, including the men employed by the makers of mechanical handling equipment, and the argument has little force in a time of full employment. It has little force historically either, as the number of employed persons has risen steadily, with one or two setbacks, over the last 100 years, during which Britain has become an industrial nation. Today we have undermanned basic industries and our main trouble is not redundancy but immobility of labour, both geographically and in actual types of work.

Gaining Co-operation

" In this question of lowering costs by mechanical handling methods the national situation demands that employers and unions should both be working in the same direction. It may well be that if they worked together a little earlier, while changes are still in the planning stage, there would be much less fear of the advantages of new methods being nullified by short-sighted action by the workers on the spot.

" A word to manufacturers: do not, in order to get a sale sell a machine not rugged enough for the job. One or two experiences of early breakdown raise a prejudice against mechanical handling methods in the minds of factory managers."

COOLING WATER ECONOMY

(*continued from page* 925)

In an instance, a works applied a deep well pump for supplying the greater part of boiler feed to the water treatment plant at an average cost of 11½d. per 1000 gal. By installing a pumping trap, using very little steam, and operating at 52-second intervals to return all hot condensate to the hot well in the boilerhouse (200 ft. away), it was possible to reduce the purchase of water from the Corporation by 3500 tons a year—a saving of about £300 per annum. Another advantage gained was reduction of water hardness from 90/110 (parts per million) to 28/30, thus relieving the water softening plant.

There would appear to be a very good case for the wider use of automatic cooling water control, as a means to water economy, power and fuel economy and to reduce maintenance costs.

Remote Level Recording

REMOTE control readings of liquid level in tanks with accuracy of one-tenth of an inch are a feature of a tank gauge recently placed on the market.

The new gauge is claimed to be a distinct advance on float-controlled systems. Designed by Evershed & Vignoles, Ltd., it is a null point displacer system, the marked accuracy of which makes it eminently suited for use at oil refineries, chemical works and other industrial plant where exact indication of quantities is an important factor.

The transmitter is, in effect, an automatic dipstick installed on the top of the tank. A local indication is given and the reading is also transmitted to distant receivers which have double concentric dials normally marked in feet and inches.

A feature of the system is that zero adjustments on the transmitter can be made without breaking the flameproof jointing.

OVERSEAS CHEMISTRY AND INDUSTRY

MATERIALS FOR CHEMICAL INDUSTRY

Trends in German Technique at the ACHEMA

From A SPECIAL CORRESPONDENT IN GERMANY

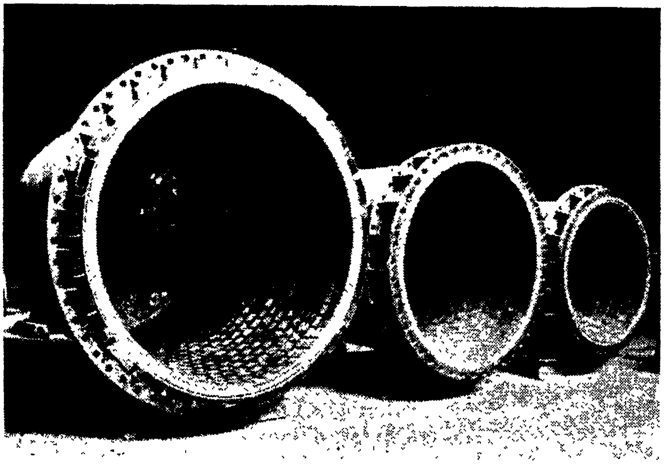
"NO chemical process is possible without suitable working raw material." This reminder of fundamentals by Max Buchner, founder of Achema and Dechema (Exhibition for Chemical Apparatus' Systems and German Society for Chemical Apparatus' Systems), seems to have inspired the display being prepared in Hall 8 of Achema 9 exhibition, in which about 120 exhibitors of raw materials for chemical industry are to demonstrate their products. It will be one of the largest exhibition halls, having a space of 6500 square metres.

The Achema, which will be held in Frankfort from July 9-16, also reflects the large commercial development of acid- and heat-resisting steels, which formerly offered some difficulty in production, making use of their tensile strength for constructional purposes. Besides this, however, the plating uses of stainless steels which depends largely on advanced welding technique, has been successfully developed.

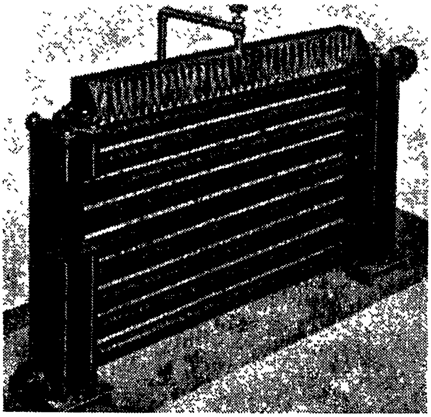
For working of plated metals, it is essential that both the basic material and the plating are welded with the most suitable welding material, to make full use of strength- and corrosion-resistance. When this principle became well known even silver-plated steels were made with a thin film of gold or gold-palladium alloy for special conditions of stress. This layer, however, must also be welded with the same rare material. Many exhibits will demonstrate that the German apparatus firms are extremely well equipped for such work. Decades of experience and mechanical training are probably of greater importance than technical improvements or patented construction.

To provide steels with high abrasion resistance one firm has been plating steel with 65 per cent ferro silicon. The product is acid- and abrasion-resistant, and, compared with ceramic materials, has very favourable heat-conductivity and resists changes of temperature up to 160° C. The non-ferrous metals, such as nickel, copper and lead, maintain their old sphere of application and are even of greater utility in connection with steel thus improved. The rubber lining, which has been in use for some time, can be further improved by adding to a soft, elastic lower layer a hard top layer, whereby it becomes much more resistant to all mechanical stress and severe temperature conditions.

Plastics and artificial resins are used in new ways for the lining of tanks. There



The novel lining of these vats consists of 65 per cent ferro-silicon plates, welded by a special process by the Eisenwerke Company



German employment of Karbate is represented by this apparatus—by Lurgi, of Frankfurt—in which the plastic-impregnated carbon forms the tubes of an acid cooler

are special applications for coatings with polyvinyl chloride, which, dependent on thermoplastic properties, can also be applied in tubular form for parts of any shape, thus offering good protection against acid. The Achema 9 shows particularly how artificial resins contribute to the improvement of various acid-resistant materials, so that they can be used extensively for construction of apparatus. Both carbon and graphite, as well as ceramic materials, maintain their chemical resistance, and by plastic binding can be easily used for tubes and apparatus. They are finding widespread use for large apparatus according to the methods developed for the metal industries. They are most useful for the casting, shaping and welding of plates.

Ceramics, which originally seemed to have been reserved for the laboratory, are now available for the construction of relatively large apparatus, thanks to improved techniques. It is most probable that further progresses will be made in this direction when the various methods of heat-production are used for these materials, and the Achema presents a series of new possibilities for industrial use.

Though improvement of glass production is limited to special first-rate optical glasses, it seems, however, that this type of surface refining will find wider application as soon as the necessary apparatus becomes available in a corresponding size.

Therefore there is sufficient indication that new materials with still more highly-developed properties will be achieved. In this respect sintered oxides, which have been developed for the high-frequency techniques must be mentioned. They belong among the hardest and most fire-proof, abrasion-resistant, and chemically resistant raw materials in existence at present, and are therefore used, not only for laboratory implements, but also for highly-stressed parts of industrial accessories. Achievements of recent years have perfected the machine-technical working methods, so that extraordinary control and very low tolerances are attained, in spite of sintering of the raw materials. For high temperatures and aggressive melting, when the silicates fail, a densely sintered aluminium oxide, Alfacorund, is exhibited by a Berlin porcelain factory. This represents a refractory proof of some 2000° C.

Brazil's Fertiliser Programme

THE Société Tunisienne de L'Yperphosphate Reno has formed a company in San Paulo, the Companhia Brasileira de Adubos, in co-operation with local industrialists. The intention is to install a chain of factories for the industrialisation of natural phosphates by means of micrometric crushing. The raw materials for the preparation of superphosphates will be imported from Africa until sufficient quantities become available in Brazil.

The same Brazilian group, reinforced by French capital and technicians, has also formed a company in San Paulo under the title of Adubos Quimicos do Brasil. It will supply Brazilian farms with potash, the lack of which has contributed to the deterioration of the soil in many districts.

A third Brazilian company, Quimica Elequeiroz Produtos Quimicos S.A., are the sponsors of the new factory for the preparation of super-phosphates, with an initial capacity of 50 tons per day.

In Bahia the Orquima Company is to build a factory for the production of nitrogen, using the natural gas of Aratú, recently discovered by the State National Petroleum Council. Fourteen wells are producing gas at Aratú, the output being limited at present to 8 million cu. m., of which 90 per cent is methane. The programme proposes that the Bahia factory will produce 45,000 tons of nitrate annually, equivalent to 10,000 tons of active nitrogen.

INDIAN FERTILISERS

Local Production Research

A PROCESS is reported to have been discovered, in the inorganic laboratory of the Institute of Science, Bombay, by which it is thought that as much as 65 per cent of the sodium sulphate deposits in Didwana, Jodhpur, can be converted into sodium bicarbonate and ammonium sulphate in a single reaction. Almost pure sodium bicarbonate comes down as a precipitate and this can be converted into soda ash. Ammonium sulphate can be recovered from the mother liquor at a certain stage in the cycle of reaction. It is believed that this investigation will be of economic signficance to the Government of India and the State of Rajasthan.

The proposed establishment of a fertilisers factory at Bhadravathi has been the subject of discussion between Mr. H. C. Dessapa, Minister of Industries and Finance, Government of Mysore, and Mr. C. P. Reddi, Minister of Industries, Government of Madras. The initial capacity of the factory would be about 50,000 tons of chemical manure and production could be doubled in due course. Bhadravathi has the advantage of a near railway line, availability of raw materials and power and water supply. It is estimated that the capital to be invested in the project will be Rs. 30 million, inclusive of working capital.

The Government of India, in a recent communication to the authorities of the various States, urges that full use be made of the phosphatic pool maintained by the Central Government and that adequate steps be taken for educating the cultivator in the use of phosphates.

Stainless Steel Shortage

THE Government of India has directed the Madras State Government not to encourage the starting of any new firm for the manufacture of stainless steel utensils until the foreign exchange position improves. The Government has been receiving a number of applications for the import of stainless steel from established manufacturers of utensils and from new ones. It observes that stainless steel has also to be imported for the manufacture of chemical ware, railway coach fittings, hospital ware and for other important industrial uses. The Government observes that aluminium or brass would serve equally well for ordinary utensils, for which stainless steel has been used.

GLASS RESEARCH

New Indian Laboratory

THE fourth in the chain of national laboratories being set up by the Indian Council of Scientific and Industrial Research, namely the Central Glass and Ceramic Research Institute, at Calcutta, is being rapidly equipped and will soon be formally opened. Parts of the laboratory and technological section are already completed and research work has been in progress for some time. A sand washing plant of a capacity of half a ton per hour has been obtained from the United Kingdom and demonstrations of the improvement of sand are being arranged for the benefit of the glass industry.

A magnetic separator for improving the quality of the glass and a magnetic percolator for heating clay slips have been installed and the institute has already set up a section for the making of the refractories to be used in the construction of its furnaces. It has undertaken the testing of glass and ceramic raw materials and a number of samples of glass-making sands and stones, quartzites and feldspars have been examined.

Deodorising Shark Liver Oil

THE advantages of the higher vitamin A potency of shark liver oil compared with cod liver oil are offset by its more offensive smell. Deodorisation is therefore a vital problem for the shark liver oil industry. A research paper in the May issue of the *Journal of Scientific and Industrial Research* dealt with tests in this matter conducted by the Department of Chemical Technology, University of Bombay.

A number of absorbents such as dried skimmed milk and tomato pulp, were tried in the presence of such solvents as absolute alcohol, propylene glycol, carbon tetrachloride, benzene, acetone and petroleum ether. The mixture of oil absorbent and solvent was refluxed over a water bath for two hours and the solvent was distilled off under vacuum.

Results obtained with alcohol and propylene glycol were satisfactory when used in combination with dried skimmed milk powder and gum tragacanth. The fishy odour was considerably dispelled and the oil was bland. An overall loss of 1 per cent of vitamin A occurred with the use of skimmed milk powder and 0.5 per cent when gum tragacanth was employed.

OVERSEAS

Biggest Achema Exhibition

It is expected that more than four thousand chemical science experts will atend the Achema IX Exhibition in Frankfurt from July 9 to 16. Latest reports state that eight large halls have been booked by 450 firms, 10 per cent more than supported the last exhibition in 1937. (*See page* 928.)

Whale Oil £100 per Ton

An indication of the heightened demand for whale oil products is the purchase in advance by Continental buyers at £100 per ton of the prospective yield of two Norse whaling expeditions off West Africa this summer. Last year £80 per ton was paid in advance in some cases. The advance now is associated with the reduced vegetable oil shipments from the East Indies.

Prison for Penicillin Profiteer

A Bombay city chemist, Chimanlal Baliram Mehta, was sentenced to four months' rigorous imprisonment and a total fine of Rs.20,600 on a charge of profiteering in penicillin. He was arrested after he had sold a penicillin ampoule for Rs.18 instead of Rs.6 and three annas, its specified price. The Government of Bombay has imported 16 tons of penicillin from the United Kingdom "to break up black-marketing in this life-saving drug."

£25,000 for Norwegian Zinc

The Norwegian Government has granted a loan of Kr.500,000 (£25,000) to A/S Bleikvassli Mines which is being organised to mine the lead and zinc deposits in Korgen in North Norway. In 1938 Norwegian zinc production totalled 14,800 tons, but this year it will only be 10,000 according to estimates, and a larger production is not considered possible in the present mines. The deposits in Korgen are stated to be large and warrant operation for a long period.

Joint Aluminium Project

The British Aluminium Co., Ltd., announces that, in conjunction with Aluminium, Ltd., of Montreal, Canada, it is undertaking a comparative study of the suitability of sites in British North Borneo and the Gold Coast for the production of aluminium. A committee of experts drawn from both companies, under the leadership of Mr. W. B. C. Perrycoste, overseas production manager of the British Aluminium Co., Ltd., will shortly be visiting these territories to make technical investigations.

Norwegian Machinery for Peru

A Norwegian company, Det Norske Aktieselskap for Elektro-Kemisk Industri, has received an order for delivery of machinery to an electrical iron works in Peru. The contract is worth several million kroner, and Norwegian engineers will be sent to Peru to supervise the installation.

Fertilisers for Holland

Rationing of potash fertilisers in Holland was lifted at the beginning of the year and the Dutch Government is to consider imports from Germany and Poland in order to meet its requirements of 150,000 tons annually. France was formerly the main supplier. A third plant for the production of nitric acid has been put into operation at the State mines at Limburg.

Selective Solvents

The American Cyanamid Co. claims that its recently introduced solvents, β,β'-oxydipropionitrile, β,β'-thiodipropionitrile and β,β'-iminodipropionitrile will greatly simplify such separations as that of monomethyl aniline from dimethyl aniline. They are said to be excellent solvents for most organic compounds but immiscible with aliphatic hydrocarbons and possess good selectivity for aromatic compounds.

£100,000 for Science

Mr. Isaac Wolfson, chairman of the Great Universal Stores, and chairman of the Weizmann Institute Committee in England, has given £100,000 to the Weizmann Institute of Science in Rehovoth, Israel. Before leaving New York last week, Mr. Wolfson observed that the institute's work was contributing not only to the future development of Israel but also to the advancement of science in every part of the world.

Expansion of New England Industry

A prediction that New England industry would continue to expand was made by John J. Healey, Jr., speaking as chairman at the Boston Regional Meeting of the American Institute of Chemical Engineers. The present fortunate position, he recalled, had its roots in the 17th century, when Boston acquired John Winthrop, Jr., as its first chemical engineer—in 1631. Winthrop started salt manufacture, iron making and saltpetre extraction, and financed his ventures at a time when European industries were still hampered by the limited resources of individual owners.

HOME

Israeli-U.K. Oil Talks

Mr. David Horowitz, economic adviser to the Israeli Government, and director general of the Ministry of Finance in Jerusalem, arrived in London last week for talks on oil and other discussions.

Physics of Lubrication

"The Physics of Lubrication" is the subject of the summer conference to be held by the Institute of Physics at Manchester University from June 29 to July 1, 1950.

"Petroleum Distributors' Economy"

The reduction of petroleum marketing divisions in the U.K. from 13 to 10 (The Chemical Age, 62, 791) related only to Shell-Mex and B.P., Ltd. Scottish Oils and Shell-Mex, Ltd., which was mistakenly associated with this reorganisation, is in effect the separate Scottish department of the group and is not affected.

U.K. Light Metal Statistics

Ministry of Supply statistics relating to U.K. production, imports and consumption of light metals in April include the following totals (in long tons): Virgin aluminium: production 2433, imports 12,499. Secondary aluminium: production 6642. Aluminium scrap arisings 6978, consumption 9258. Aluminium fabrication 16,156. Magnesium fabrication 285.

Industrial Health Lecture

The third Mackenzie industrial health lecture, given under the auspices of the British Medical Association in conjunction with the Association of Industrial Medical Officers, will be delivered by Professor R. E. Lane on June 28, at 2.30 p.m. in the Main Hall, Nuffield House, Queen Elizabeth Hospital, Birmingham. His subject is "Education and Industrial Health."

Preventing Scottish River Pollution

In a renewed campaign to prevent the pollution of rivers and streams in Scotland the Angler's Co-operative Association is seeking the support of Scottish angling clubs, with a view to taking legal action against firms which allow industrial effluents to jeopardise fishing rights. It is foreseen that such action may conflict with permission which has been granted in some cases many years ago for the release of effluents. Some previous attempts to prevent pollution of inland waters have resulted in protracted and inconclusive legal actions.

Coal Production

Britain's output of deep-mined coal last week totalled 4,069,500 tons. This compared with 4,005,700 tons in the previous week and 4,056,100 tons during the corresponding period last year.

Borax London Offices

Borax Consolidated, Ltd., is reoccupying on June 26 its pre-war offices, which were requisitioned during the war. at Regis House, King William Street, London, E.C.4. (Telephone: Avenue 7333-8; Telegrams: Colemanite, Telex, London).

Shell Move in the Midlands

Because of expansion, the Midlands Division of Shell Chemicals, Ltd., has moved to larger offices at Clarence Chambers, 39 Corporation Street, Birmingham 2. The telephone number remains Midland 1742.

Coated Papers Agreement

Shell Chemicals, Ltd., has concluded a licence agreement recently with the Associated Paper Mills, Ltd., London, for the manufacture of paper and board coated with Shell VPI (vapour phase inhibitor). Shell Chemicals have made similar agreements with R. A. Brand and Co., Ltd., London, and Leonard Stace, Ltd., Cheltenham.

Industrial Disease in April

One death, in the tar industries, from epitheliomatous ulceration (skin cancer), was reported in April. There were 13 new cases of the disease (pitch 7, tar 3, oil 3. Other cases of industrial diseases were these: chrome ulceration 5 (chromium plating 3, bichromates manufacture 1, other industries 1); lead poisoning 2 (pottery 1, electric accumulator 1); aniline poisoning 1; compressed air illness 14; anthrax 2 (handling hides and skins).

BISRA Alloys Group

A Constitution of Alloys Group has been appointed by the Metal Physics Committee of the British Iron and Steel Research Association. The group is under the chairmanship of G. V. Raynor, professor of metal physics, Birmingham University, and consists of 13 members drawn from a wide field of research and industry. The object of the group is to consider the co-ordination of phase-diagram work being carried out in connection with metallurgical subjects, particularly the transitional elements and high-temperature alloys.

• PERSONAL •

Prof. P. B. Moon

Colonel M. A. McEvoy, managing director of Bamag, Ltd., the London chemical engineers, has left for a tour of the Middle East, Pakistan and India to inspect some of the chemical and vegetable oil plants recently completed by his company in those countries. At the invitation of the Government of Ceylon, he will also spend a few days in Colombo to discuss the industrialisation there. He will break his outward and return journeys in Greece and Cyprus, to take part in discussions of a similar kind.

The honorary degree of Doctor of Science is to be conferred on Prof. M. L. E. Oliphant by Birmingham University on July 1 in recognition of his services to the Department of Physics since 1937. Another recipient of the D.Sc. will be Dr. Leonard Colebrook formerly chief medical officer of the Burns Unit at the Birmingham Accident Hospital. He was a pioneer in the use of sulpha drugs and is distinguished for his work in applied bacteriology.

Colonel W. E. Phillips, chairman of Chemical Developments of Canada, Ltd., has announced the following appointments: President, Arthur H. Martin; vice-presidents, Dr. Carey R. Wagnfr, Dr. Douglas S. Calder, and R. F. Powell; comptroller, W. J. Strain; and secretary, Steele Sifton.

Mr. Frederick William Clark, Warren Drive, Wallasey, who brought about the formation of the Salt Manufacturers' Association, left £69,388.

Prof. Philip Burton Moon has been appointed Poynting Professor and director of the department of physics, Birmingham University, in succession to Prof. M. L. E. Oliphant. Prof. Moon, aged 48, joined the staff in 1936 as lecturer, and 10 years later was appointed to the second chair of physics. During the war he was one of a team of physicists engaged in atomic research and spent two years in America. He was present at the observation of the first atomic bomb test in New Mexico. Educated at Sidney Sussex College, Cambridge, Prof. Moon is author of a number of papers on atomic and nuclear physics, and is a leading member of the Atomic Scientists' Association.

The following officers and council have been appointed by the Electrodepositors' Technical Society for the forthcoming 26th session (1950-51), which commences in September:—President: A. W. Wallbank; immediate past president: G. E. Gardam; vice-presidents: R. A. F. Hammond, A. W. Hothersall, H. Silman, W. E. Wright; hon. treasurer: F. L. James; hon. secretary: S. Wernick; Faraday Society representative: E. A. Ollard; council: H. Cann, J. W. Cuthbertson, E. J. Dobbs, J. Hooper, E. H. St. Clair Moorey, C. W. Parker, J. M. Sprague.

Mr. W. Cooper, studying the chemistry of synthetic rubber with the chemical research division at the new Dunlop Research Centre, has been awarded one of the five studentships allocated to Great Britain for a three months' course at the Massachusetts Institute of Technology. Seventy-five students from different countries, all with high academic qualifications and all at present working in industry, will each carry out some definite investigation in his own partcular field.

At a meeting of the governors of the Royal Technical College, Glasgow, last week the resignation of Sir James French from the chairmanship was announced. He will be succeeded in October by Sir Andrew McCance, a leading metallurgist and deputy chairman and joint managing-director of Colvilles, Ltd. Mr. Alexander Turnbull, who presided at the meeting, was elected vice-chairman.

Mr. T. Clyde Hewlett has been appointed a director of the Anchor Chemical Co., Ltd.

(continued overleaf

The following appointments were announced this week by the National Coal Board: MR. I. W. CUMBERBATCH, area general manager of the North Staffordshire Area, will succeed SIR BEN SMITH as chairman of the West Midlands Division. Mr. Cumberbatch, who comes of a mining family, was educated at the High School and Sutherland Institute, Longton and North Staffs Technical College, Stoke-on Trent. MR. G. H. JONES becomes deputy chairman of the divisional board, and he will be succeeded as labour director by MR. JOSEPH JONES. All the appointments become effective from July 1.

The ballot for the election of council members of the British Engineers' Association resulted in the addition to the council of MR. E. W. THOMPSON (John Thompson Water Tube Boilers, Ltd.). Retiring members re-elected in the ballot were: MESSRS. GEORGE BRYDEN, G. F. DAVIES, K. FRASER, C. D. H. MACARTNEY-FILGATE, MAJOR R. MILES, MESSRS. J. F. R. MITCHELL, J. G. W. PAWLYN and P. A. SANDERS.

MR. DONAL SULLIVAN, sales manager of De La Rue Extrusions, Ltd., and De La Rue Floors and Furnishings, Ltd., was presented with the British plastics trophy at a recent dinner of the Plastics Industry Golfing Society at Grosvenor House, W.

A tablet describing a silver cross for the Communion table, given in memory of the late Lord Leverhulme, was unveiled on June 4 at St. George's Congregational Church, Thornton Hough.

Among the King's Birthday Honours last week, MR. H. H. FREEMAN, chargeman-fitter at the Dunlop Rim & Wheel Co., Foleshill, Coventry, was awarded the British Empire Medal (Civil Division). He made the first gun-firing buttons and cannon-operating gear to be fitted to R.A.F. aircraft, and he also helped in developing prototypes of other aircraft equipment from hydraulic brake-operating mechanisms to windscreen wipers.

Senior studentship awards for 1950 announced by the Royal Commission for the 1851 Exhibition include the following: DR. B. R. BROWN (organic chemistry at Cambridge University); A. JOBLING (physical chemistry at the Imperial College of Science and Technology, London) and DR. K. ROBINSON (crystallography at the University of Cambridge). Tenable for two years, the awards are of the value of £600-£650 a year.

PROFESSOR D. H. HEY and PROFESSOR H. BURTON (honorary secretaries) represented the Chemical Society (Great Britain) at the celebrations held at the University of Lyons last month to mark the 50th anniversary of the discovery of the Grignard reagents by Victor Grignard.

MR. MAURICE WM. PAYNTER has been appointed, from July 1, secretary of the Institute of Packaging, the headquarters' address of which from the same date, will be 55-61 Moorgate, London, E.C.1. (Telephone: MONarch 6226).

Biological Hazards of Atomic Energy

POSSIBLE biological hazards arising from the development and application of atomic science now and in the future will be the subject of a two-day conference to be held in London next October. The meeting, to be held at the Royal Institution, Albemarle Street, W.1, on Friday and Saturday, October 20 and 21, is being jointly arranged by the Institute of Biology and the Atomic Scientists' Association.

The four sessions will be comprised as follows: 1—Biological and medical effects of nuclear radiations; 2—Tolerance levels and measures of protection; 3—Biological implications; 4—Atomic energy and the biological future. At each session opening addresses will be given by invited speakers and will be followed by discussion.

Preliminary arrangements are being made by a joint committee consisting of Professor K. Lonsdale, Dr. F. C. Champion and Professor J. Rotblat representing the ASA, and Professor Alex. Haddow representing the Institute of Biology.

Obituary

THE untimely death of DR. FABIUS GROSS, on June 18, was reported early this week. Dr. Gross, who left Germany in 1933, carried out biological research at London and Plymouth until the recent war. He then turned to experiments devised to test the effects of adding ordinary chemical fertilisers to enclosed areas of the sea, in order to increase the fish population and thus combat the ravages of over-fishing. His work gave firm indications of the possibilities of a marine fish farming technique. Dr. Gross leaves a widow and two young sons.

£5000 for Plastics Acid Plant

Tenaplas, Ltd., makers of plastics chemical plant and appliances, has just completed a £5000 acid distributing plant for a firm in Belgrade. The installation, of polythene, includes more than 5000 ft. of extruded 8 in. tubing, 1200 flanges and contains more than 1800 ft. of welding.

Chemical and Allied Stocks and Shares

A NUMBER of factors have combined to make for cautious markets, the chief of which is a return of political uncertainties since the reassembly of Parliament. British Funds eased, but later rallied, the result of the 2½ per cent National War Bonds (1949-51) conversion—some 70 per cent of the £714 million total having been converted into the new 2½ per cent Funding Loan—being regarded as satisfactory. This new funding stock was quoted at 99 9/16, and the new 3½ per cent Treasury stock, issued as interim compensation to colliery companies, has remained at par since dealings started.

Industrial shares lost a further small part of recent gains, for which the anticipation of increased wage demands and talk of currency changes may have been partly responsible. Nevertheless, the European payments scheme, which is expected to come into force next month, by making European currencies convertible should expand trade without the fear that some countries might suffer gold and dollar losses. It is believed that companies with widespread interests in world markets will benefit materially from the double taxation relief clause of the Finance Bill.

Generally, shares of chemical and kindred companies have been firm, with movements in most cases not exceeding more than a few pence. Imperial Chemical strengthened to 41s. 3d., Monsanto were 48s. 6d., and helped by the good impression created by the financial results Laporte Chemicals 5s. ordinary moved up to 9s. 10½d. Lawes Chemical were 10s. 6d., Calor Gas 18s. 9d., Albright & Wilson remained steady at 28s. 3d. and Brotherton, on further consideration of the financial results, rose afresh to 20s. F. W. Berk were 15s. 6d., Boake Roberts 26s., Bowman Chemical 4s. shares 5s. 3d. and Pest Control 6s. shares 7s. 9d. British Glues and Chemical further strengthened to 21s. 9d.

Lever and Unilever were around 40s. 4½d., Lever N.V. were 38s. 3d. awaiting the dividend announcement. Borax Consolidated were good with a sharp rise to 56s., British Oxygen held their advance to 97s. and British Aluminium have been steady at 40s. 6d. Turner and Newall, after their recent rise, came back to 88s. 9d. The 4s. units of the Distillers Co. changed hands around 18s. 7½d. Triplex Glass remained active in the region of 24s. 3d., although the market is doubtful if the dividend will be increased at this stage. United Glass Bottle held their rise to 75s. and General Refractories have been steady at 22s. 6d.

United Molasses turned easier at 48s. 7½d. Glaxo Laboratories at 48s. 9d. failed to hold best prices. Fisons, after a further rise, came back slightly to 24s. 9d. British Chemicals and Biologicals 4 per cent preference were 16s. 9d. and L. B. Holliday 4½ per cent preference 19s. 9d. Reckitts firmed to 108s. 6d. on the results.

Movements in shares of companies connected with plastics have been small and indefinite. British Xylonite were 80s., British Industrial Plastics 2s. shares 5s. 10½d., and De La Rue 24s. 9d.

Boots Drug eased slightly to 48s. 6d. Associated Cement (85s. 6d.) held all but a small part of their good advance and British Plaster Board 5s. units remained active around 16s. awaiting the results. Iron and steels were less active, but hardly affected by the controversy over the Schuman plan. Oils have been uncertain. Anglo-Iranian were back to £7 and Shell 66s. 3d. Ultramar Oil, after their recent sharp jump, came back to 14s. 3d. and the debentures were £7 down at £150.

Proposed Durban Oil Refinery

THE project to establish an oil refinery at Durban estimated to cost £6 million has not yet been abandoned. The proposed refinery would handle over 500,000 tons of crude oils a year. Its main products would be petrol, lubricating oil and fuel oil. It would take about 2½ years to erect. Negotiations between the Union Petroleum Refinery (Pty.), Ltd., and the Union Government were opened over a year ago. The managing director, Mr. H. Moore, recently returned to Durban after discussions with his principals in England, said the scheme was being held up because of the Union's high taxes on imported crude oils. South Africa was at present spending about £25 million a year on importing finished oil products and the figure was rising rapidly. Given sufficient refineries, South Africa could save about £15 million a year. Under the present system of taxation crude oils cost more to import than did the finished products. It was intended to press the Government to reduce this high tax rate.

Chemical Employment

449,000 were employed on March 31 in chemical manufacturing and allied trades in the United Kingdom, a decline of 1000 from February.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

INSECTICIDE ACTIVATED PRODUCTS, LTD., London, E.C. (M., 24/6/50.) May 23, deb., to Arbon Langrish & Co., Ltd., securing sums not ex. £2000 which the holders may be called upon to pay under a certain guarantee; general charge. *Nil. Jan. 12, 1950.

Satisfaction

LEWIS BERGER & SONS, LTD., London, E., paint mfrs. (M.S., 24/6/50.) Satisfactions May 23 of 1st and 2nd debs. reg. Mar. 25, 1904.

Company News

Timothy Whites & Taylors, Ltd.

Net profits for year ending December 31, 1949, of Timothy Whites & Taylors, Ltd., including the dividends received from its subsidiaries, were £335,668. A final dividend on the ordinary shares of 20 per cent actual, making, with the interim dividend already paid, a total dividend for the year of 32½ per cent, has been recommended. This is a similar total dividend to that declared for the previous year.

New Registrations

Brook Chemicals, Ltd.

Private company. (13,367). Capital £1000. Manufacturing chemists, druggists, drysalters, oil and colourmen, etc. Directors: V. J. Albericci, D. V. Dolan.

Empire Distributing Company (Disinfectants), Ltd.

Private company. (483,025). Capital £1000. Manufacturers of disinfecting preparations and materials, etc. Directors: E. G. Knowles, F. L. Parkinson, W. Parkinson. Reg. office: Kay Street, Preston.

Jenolite (Scotland), Ltd.

Private company. (27,765). Registered in Edinburgh June 10. Capital £1000. Manufacturers and dealers in chemicals and chemical preparations, etc. Directors: J. H. Lawrence, H. A. Lawrence, 25 Montagu Street, London, W.1.

Pantarei, Ltd.

Private company. (482,862). Capital £1000. Manufacturers of scientific apparatus, instruments and accessories, electrical, mechanical, and chemical instruments and apparatus, etc. Directors: G. Tichauer and H. M. Tichauer.

Ransley-Robinson Research Laboratories, Ltd.

Private company. (483,294). Capital £200. Manufacturing and analytical chemists and druggists, drysalters and herbalists, etc. Directors: P. M. Rowntree, J. H. Clements. Reg. office: 65 High Street, Sutton, Surrey.

Chas. Stanley & Son, Ltd.

Private company. (482,549). Capital £100. Distillers, manufacturers of all animal and vegetable oils, waxes, pitch, coal tar, and derivatives, glycerine, etc. Directors: T. A. Thornber and W. Jewsbury. Reg. office: Clayfield Oilworks, Slaithwaite, Yorks.

Stewart Chemicals, Ltd.

Private company. (483,148). Private company. Capital £100. Manufacturers of chemicals, gases, drugs, etc. Directors: D. J. Gabriel, F. Gelder. Reg. office: 102 Bishopsgate, E.C.2.

U.S. Minerals and Metals

MINE production of bauxite in the U.S.A. in the first quarter of this year totalled 325,025 long tons (dried equivalent), compared with 317,738 tons in the January-March period last year. U.S. production of primary aluminium in the same period aggregated 161,438 short tons, against 157,957 tons in the comparing 1949 period.

U.S. recovery of secondary zinc in all zinc-base products totalled 11,900 tons in January, which represented a 4 per cent gain over December and the highest monthly recovery total recorded since March, 1949. Recovery of secondary zinc in chemicals (zinc sulphate, zinc ammonium chloride and lithopone) reached a total of 1436 tons in January compared with 1113 in December.

Output of zinc in May reached 79,645 tons, the highest monthly total for the last six years.

Prices of British Chemical Products

Lead Metal Supplies Expected to Become Easier

THERE has been a steady absorption of supplies in the general run of industrial chemicals, and new buying interest has been reasonably satisfactory for the period. So far as values are concerned, the undertone continues firm and most recent changes have been in the chemical compounds of non-ferrous metals. The Convention quotations for white and red lead are unaltered on the week but in some quarters the supply position of the metal is expected to become easier. A good call has been reported for the dibasic and tribasic phosphates of soda and also for the photographic grade of hyposulphite of soda. Quiet conditions continue to prevail in the coal tar products market and export trade is very competitive, with the possible exceptions of pitch and creosote oil.

MANCHESTER.—The movement of textile and other industrial chemicals in the Lancashire area has been affected to some extent by the commencement of holidays. Satisfactory trading conditions have been reported, however, in most sections of the Manchester chemical market. Delivery specifications for the leading alkali and other heavy chemicals are circulating freely in the home section of the market and a fair amount of new business for domestic consumption and for export has been placed. Prices continue to be firm. There is a moderate trade in fertiliser materials and a fair movement of supplies of most descriptions of tar products has been reported.

GLASGOW.—There has been renewed activity during the past week in the Scottish heavy chemical market. Exports have also shown considerable improvement.

Price Changes

Rises: Ammonium sulphate, calcium chloride, compound fertilisers, copper carbonate, copper sulphate, sodium percarbonate, sodium sulphide, sodium phosphate (anhydrous), sodium sulphide, zinc oxides.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, Diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots: MANCHESTER: Powder, £52 d/d.

Ammonium Chloride.—Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£160 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6½d, to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£140 10s. per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 8d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Sulphate.—£50 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 2s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1260 s.g. 128s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £85 per ton; dark tech., £75 per ton ex works; barrels returnable.

Lead Acetate.—Nominal.

Lead Carbonate.—Nominal.

Lead Nitrate.—Nominal.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £114 5s.; orange lead, £126 5s. Ground in oil: red, £136 15s.; orange, £148 15s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £123 10s. per ton, Ground in oil, English, under two tons, £143.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£114 5s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d. £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal,

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Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1 ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £6 13s. to £7 13s. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 2s. to 3s. 3½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £64.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £25 15s. per ton, d/d, in drums; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—160° Tw., £6 16s. to £7 16s. per ton; 140° Tw., arsenic free £5 10s. per ton; 140° Tw., arsenious, £5 2s. 6d. per ton; Quotations naked at sellers' works.

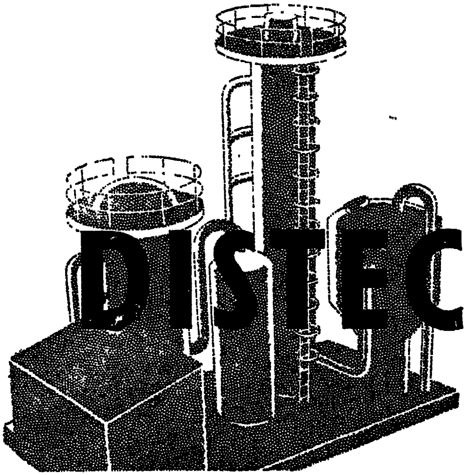
Tartaric Acid.—Per cwt: 10 cwt. or more £8 5s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £121 10s.; green seal, £120 10s.; red seal, £119.

Zinc Sulphate.—Nominal.



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Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £10 12s. (July, £12 6s. 6d.)

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade. where available, £10 17s. I.C.I. Special No. 1, £16 11s. (July, £19 4s.). National No. 2, £11 0s. 6d. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal, ex works: 90's, 3s. 3d.; pure, 3s. 5¼d.; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale 98%, 3s. 3d. per gal.; 99.5/100%, 3s. 11d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°. 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £9 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works; export trade, 110s. per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/160°, 22s. 6d. MANCHESTER: 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2¼d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d, per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: June 17. The prices of all refined oils and fats remain unchanged during the eight-week period ending on August 12. During the four-week period ending July 1, price of linseed oil was raised from £132 to £134 and linseed oil (foots) from £82 to £84. Prices of all other unrefined oils and fats remained unchanged.

Technical News and Services

PROBLEMS of overcoming resistance to wear and at the same time giving improved performance continue to produce innovations in the construction of precise analytical balances. Synthetic sapphire planes were introduced a short time ago to replace those made of agate. A further development now announced by J. W. Towers & Co., Ltd., is the fitting of synthetic ruby knife edges.

This is the first time knife edges have been employed on a commercial scale for this purpose. The synthetic ruby is entirely homogeneous and free from flaws and in this respect alone is considered to be superior to natural agate. All Towers balances will soon be obtainable fitted with synthetic ruby knife edges and synthetic sapphire planes.

* * *

"EXTRACTION and Fabrication of Aluminium" is the title of a 115-page book published by the Northern Aluminium Company, Ltd., London. The first section on extraction deals with occurrence of the ores, bauxite deposits, reduction and refining and mining operations generally. The second is devoted to the properties of the metal and its alloys and discusses specification and semi-fabricated forms.

* * *

A NEW circular providing a systematic and readily accessible summary of information about nickel has just been released by the U.S. National Bureau of Standards. "Nickel and Its Alloys" (50 cents) combines information from the Bureau's own investigations and from published records of work done elsewhere. Particular attention is paid to the physical and mechanical properties of nickel and its ferrous and nonferrous applications.

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CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

CHEMICAL ENGINEERS. Excellent prospects and permanency offered to experienced Chemical Engineers by The Bahrein Petroleum Company Limited, Persian Gulf. Applicants must possess a B.Sc. Degree or equivalent from a recognised Engineering School. Men, who in addition to their Chemical Engineering training, have had training in Mechanical Engineering and practical experience in designs problems applicable to the distillation and fractionation of hydrocarbons common to crude oil and coal-tar refining or chemical plants and other allied industrial processes, are preferred. Salaries according to qualifications and experience, plus kit allowance, provident fund, free board, air-conditioned living accommodation, medical attention and transportation costs. Agreements, 24 to 30 months, with paid leaves. Write, giving full particulars of qualifications, age, education, experience and salary required, to **Box 3427, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

CHEMIST for Midland Metal Refining works wanted, preferably Metallurgist. Write Box 3523 c/o CHARLES BARKER & SONS LTD., 31, Budge Row, London, E.C.4

CIVIL ENGINEERS. Excellent prospects and permanency with Bahrein Petroleum Company Limited, for Civil Engineers not over 40 years of age with Degree and experience of design and erection of steel and reinforced concrete supporting structures as encountered in oil refinery or similar heavy chemical process plants. Twenty-four to thirty months agreements, with passages paid, kit allowance, provident fund, paid leaves, free messing and air-conditioned accommodation. Low living costs. Write, with full particulars of age, experience, education and salary required, to **Box 3428, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

DESIGNS ENGINEERS. Excellent prospects and permanency with Bahrein Petroleum Company Limited, for Mechanical Engineers, not over 40 years of age, with B.Sc. Degree or equivalent qualifications. Experience required in design and/or construction of oil refineries, coal-tar, chemical distillation plants, or similar involving electrical and steam systems, pressure vessels, fractionating columns, heat exchanges and pumping equipment. Twenty-four to thirty month agreements, with passages paid, kit allowance, provident fund, paid leaves, free messing and air-conditioned accommodation. Low living costs. Write, with full particulars of age, experience, education and salary required, to **Box 3429, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

TECHNICAL SALES ENGINEER required by well known firm of Chemical Engineers in London. Work involves following-up by personal interview tenders made for a wide variety of plant; discussion of new projects with clients and all activities required to obtain orders for chemical plant. Qualifications required: 1. Good training in engineering. 2. Practical experience in chemical works an advantage. 3. Real understanding of principles of chemical engineering unit process. 4. Good personality. 5. An enthusiasm for hard work and getting orders. No commisions paid. It is essential that the applicant should live either in London or in the North East of England or Midlands. Write stating age, previous experience and salary required to Box No. C.A. 2927, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

SITUATIONS VACANT

MINISTRY OF SUPPLY invites applications from **CHEMISTS** for unestablished appointments in the **SCIENTIFIC OFFICER AND EXPERIMENTAL OFFICER** Classes at the Radiochemical Centre, Amersham, Bucks. The duties are connected with the development of new synthetic methods and the preparation of compounds containing the radioactive isotope carbon—14. General experience in synthetic organic chemistry is therefore desirable.

Candidates for S.O. Class posts should have first or second class honours degree in Chemistry or equivalent qualification. Candidates for E.O. Class posts should have minimum qualifications of Higher School Certificate or equivalent. Higher qualifications in Chemistry would be an advantage.

Salaries according to age, qualifications and experience within ranges:—

Principal Scientific Officer (min. age 31): £910–£1,177.
Senior Scientific Officer (min. age 26): £670–£860.
Scientific Officer: £380–£620.
All S.O. Class posts carry F.S.S.U. benefits.
Senior Experimental Officer (min. age 35): £705–£895.
Experimental Officer (min. age 28): £495–£645.
Assistant Experimental Officer: £220–£460.
Rates for women somewhat lower for all posts.

Housing accommodation may become available in some cases. Write quoting F.398/50/A, to the **Ministry of Labour and National Service, Technical and Scientific Register, K, York House, Kingsway, London, W.C.2.** Closing Date, 29 July 1950.
H.Q. 639-40 6/50. HB.

NORTH WESTERN GAS BOARD
LIVERPOOL UNDERTAKING
APPOINTMENT OF THREE ASSISTANT CHEMISTS

APPLICATIONS are invited for the positions of Assistant Chemists on the staff of the Liverpool Undertaking.

Applicants should have had industrial experience, not necessarily in the Gas Industry, and preference will be given to those holding a Science Degree or Associate Membership of the Royal Institute of Chemistry.

The commencing salary will be within the range of £450 to £650, depending on qualifications and experience. The successful candidates may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt in future.

Applications, giving details of qualifications and experience of the candidate, and with the names of two referees, should be forwarded to the **Personnel Superintendent, Radiant House, Bold Street, Liverpool 1.** not later than 10 days after the appearance of this advertisement.

PROJECTS ENGINEER, with Chemical Engineering background, and/or experience in the Oils and Fats Industry, required for interesting position. Only candidates capable of working conscientiously and on own initiative need apply to

BAMAG LIMITED (MKS.),
Rickett Street, London, S.W.6.

THORIUM LIMITED have vacancies for **QUALIFIED CHEMISTS** in their factory at Ilford. Applicants should have first class honours degrees in chemistry and should have done post-graduate research or should have had some years of industrial experience in inorganic chemistry. Successfull applicants will be required to undertake work in connection with new developments in the 'rare earth' field and should normally be between the ages of twenty-two and thirty. Salaries will depend upon qualifications and experience, and there is in existence a contributory Pension Fund. Applications should be made to the **General Manager, Thorium Ltd., 10 Princes Street, Westminster, London. S.W.1.**

FOR SALE

VARIOUS MIXERS FOR SALE

No. 200 ONE nearly new **WERNER PFLEIDERER JACKETED MIXER OR INCORPORATOR.** Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with handwheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gears, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the top of the tipping screw

No 204 One **WERNER PFLEIDERER MIXER OR INCORPORATOR,** similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in. diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 205 One larger **WERNER-TYPE MIXER OR INCORPORATOR,** by Dobson & Barlow, with C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 6 in. by 3 ft. 7 in. by 3 ft. 10 in. deep, with a jacketed bottom and sides to within about 12 in. of top, and fitted with double "Z" type agitators, counterbalanced cover, machine-cut gears at each side, steel backframe with counterbalancing weights and self-contained belt-driven tipping gear and main triple fast and loose belt pulleys 30 in. diam. by 6½ in. face, with belt fork. Approximate overall sizes, 12 ft. long by 8 ft. wide by 10 ft. high.

No. 206 One **DITTO** of the same pattern, by **DOBSON & BARLOW**

No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double "Z" mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One **HORIZONTAL "U"-SHAPED MIXER,** steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

No. 210 One **HORIZONTAL MIXER** as above.

No. 211 One **HORIZONTAL MIXER** as above.

These three "U"-shaped mixers are in some cases fitted with steel plate covers and a steam jacket round the bottom and extending to within about 18 in. of the top with plain end plates.

Further details and prices upon application

Write RICHARD SIZER LIMITED, ENGINEERS CUBER WORKS HULL.

PAINT-MAKING MACHINERY for dis'l. Mill Edge Runner, High-speed Mixer, Tar Boiler, Triple Roll Mill, Single Roll Mill, Pug Mixers, Tanks, etc. For further details, apply **C. I., Ltd., Argall Avenue, London, E.10.**

FOR SALE

600

MIXING MACHINES

TWO **BLAIR CAMPBELL** Jacketed Trough **MIXERS.** Copper-lined troughs, 4 ft. 6 in. by 3 ft. 6 in. by 3 ft. deep, with twin "Z" blades and glanded bearings. Counterbalanced domed cover. Hand-operated tilting. Pulley driven through gearing. 15 h.p. required to drive.

MELVIN Steam-jacketed Trough **MIXER,** 3 ft. 2 in. by 2 ft. 9 in. by 2 ft. 6 in. deep. Twin Naben blade agitators with glanded bearings. Mechanical tipping off main drive. Trough tin sprayed internally. Drive by 10 h.p. slipring motor 200/3/50, by B.T.H. through Radicon reduction gear.

Six Jacketed **MIXERS** by **BAKER PERKINS.** Trough, 31 in. by 28½ in. by 28 in., twin Naben-type blade agitators. Hand-operated tilting. Trough fitted aluminium cover. Direct drive by T/E geared B.T.H. motor, 400/440/3/50.

Three Double-trough Type Jacketed **MIXERS** by **WERNER PFLEIDERER.** Trough, 24½ in. by 24½ in. by 19½ in. deep, fitted double-fin type agitators. Driven at variable speeds through single machine-cut gearing from clutch-operated driving and reversing pulleys. Hand-operated tilting. Agitators can be used whilst tilting. 10/15 h.p. required to drive.

Horizontal **MIXER** by **KRUPP.** Internal dimensions, 5 ft. by 5 ft. by 5 ft. Non-tilting, double-trough type, heavy twin "Z" blades. Bottom slide discharge. Drive by 50 h.p. 480V. D.C. motor through gearing.

Eight Double-trough Type Jacketed **MIXERS** by **WERNER PFLEIDERER.** Internal dimensions, 2 ft. 4½ in. by 2 ft. 5 in. by 2 ft. 3½ in. deep. Fitted twin double-fin type agitators, driven through gearing by pulleys. Hand-operated tilting. 10/15 h.p. required to drive.

Horizontal Steam-jacketed Phosphor-bronze Tilting **MIXER** by **MELVIN,** 2 ft. 5½ in. by 2 ft. 2½ in. by 2 ft. deep. Twin PB double Naben type agitators. Hand-operated tilting. Drive by pulleys through gearing. Pulleys complete with belt striking gear.

Three C.I. Horizontal Double-trough, Steam-jacketed **MIXERS** by **SMEDLEY.** Internal dimensions, 3 ft. 6 in. by 3 ft. 6 in. by 2 ft. 3 in. deep. Double Naben type agitators. Fast and loose pulley drive. Power tilting, clutch operated.

DUPLEX MIXING and Kneading Machine by **MORTON OF WISHAW.** Steam-jacketed trough, 42 in. by 38 in. by 30 in., working capacity, 115 gallons. Fitted twin gunmetal double Naben type agitators. Counterbalanced lid secured by quick-release clamps. Int. W.P., 15 lb. sq. in. or high vacuum, 30 lb. sq. in. in jacket. Power-operated tilting. 25/30 h.p. required to drive.

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"Baker Perkins" Jac. Twin Blade **TIPPING MIXERS,** 30 in. by 28 in. by 28 in. deep.
DISINTEGRATORS, by "Carter," 1½ size, 400/3/50, also type "AA."
Lab. **FILTER PRESS,** 4 plates, 3 frames 7½ in. sq., $\frac{5}{16}$ in. cake, with pump (unused).
"Russell" Finex **VIBRATING SIEVE,** 400/3/50.
B.D. "Douglas" **CONCENTRIC PUMPS,** 1 in. and 2½ in. delivery.

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	Cap. G.P.H.	Head in Feet	Connections Suct.	Connections Dely	MANUFACTURE	Speed r.p.m.	CONSTRUCTION	Make of Motor	H.P.
TWO	3,8000	57	7″	5″	**CARRIER**	1,450	All Iron.	**BROOK**	20
ONE	21,000	52	4″	3″	**VACSEAL**	975	Vulcanite lined.	**E.E.C.**	15
TWENTY	2,400	30	2″	2″	**DRYSDALE**	1,450	All gunmetal stainless steel shaft.	**HOPKINSON**	2
TEN	2,000	60	2″	2″	**MOPUMP**	1,450	C.I.-Body Gunmetal impeller.	**BROOK**	3
TWO	1,000	20	1½″	1½″	**SOLWAY**	1,420	C. I. body Gunmetal impellor.	**METROVICK**	¾
FOUR	10,000	147	6″	6″	**GERMAN**	1,400	Acid resisting Cast steel.	**SIEMENS**	11

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FINE Quality Centrifuged **SNOW CRYSTAL COPPERAS** continuously available in quantity. Supplied in bags or open road wagon to suit customers' requirements. Price reasonable. Contract or general inquiries invited.

Exors. of JAMES MILLS LTD.,
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HORIZONTAL **STEAM JACKETED INTERNAL MIXER** by Werner Pfleiderer, having cast iron bottom jacketed trough pan 2 ft. 4in. by 2 ft. 4 in. by 2 ft. deep., with double fin type blades.

Experiemental size **JACKETED INTERNAL MIXER**, by Werner Pfleiderer, stainless steel lined pan 18 in. square by 12 in. deep, with double fin blades.

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REPLANT WORKS, CUBA STREET,
MILLWALL, E.14.

NEW **BABCOCK & WILCOX WATER TUBE BOILER**, W.I.F. type, 2-drum. Evaporation, 15,000/16,000 lb. per hour, 250 lb. working pressure. With Superheater, Chain Grate Stoker, Soot Blowers, Ash and Clinker Hoppers. Immediate delivery.

COCHRAN No. 17 VERTICAL MULTI-TUBULAR BOILER, built 1936. 14 ft. 6 in. high by 6 ft. 6 in. diam. 2,480/3,300 lb. evaporation 100 lb. working pressure. Forced draught. Weir Feed Pump. Quantity of spares.

COCHRAN No. 5 VERTICAL MULTI-TUBULAR BOILER, 9 ft. 6 in. high by 4 ft. 3 in. diam. Evaporation, 750/1,000 lb. per hour, 100 lb. working pressure.

GREEN'S HORIZONTAL GILLED TUBE ECONOMISER, 40 tubes in two banks. 260 lb. working pressure. Only used three years.

REED BROTHERS (ENGINEERING) LTD.,
Replant Works, Cuba Street,
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Cables: **REPLANT, POP, LONDON.**

PULVERISING PLANT (300 MESH). RAYMOND LOPULCO PULVERISING PLANT by International Combustion Ltd., for fine grinding (passing 300 mesh), all complete including standard type R.L. 7. Raymond Lopulco Mill with Rotary Feeder, one Double Cone Raymond Mechanical Type Separator, one Single Cone Separator, Tubular Stocking Dust Collector, Double Type Exhauster, 50 h.p. S.C. motor standard voltage, Ellison Oil Immersed Starter, etc.

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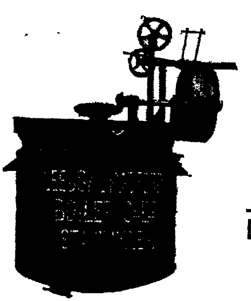

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